Vol. XXVI. Part 2.

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The Journal of the Department of Agriculture of Victoria, Australia.

February, 1928.

PRINCIPAL CONTENTS

Technique in Field Trials

Vineyard Tillage

Poultry-feeding Experiments

Poultry-keeping on the Dairy Farm

Irrigation Pastures

Crop and Fallow Competitions

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OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

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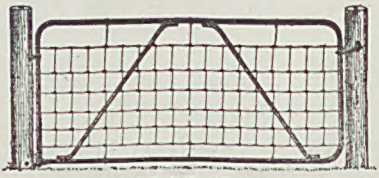

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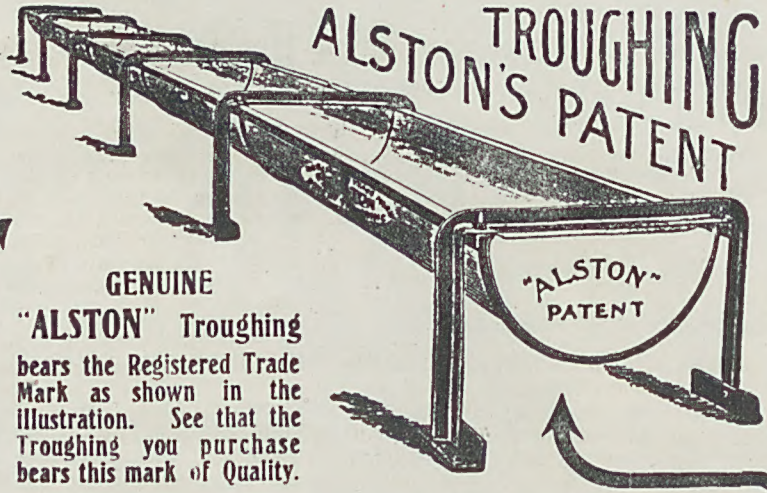

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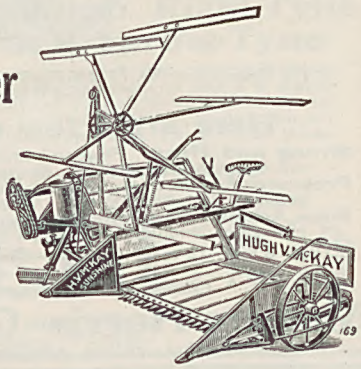

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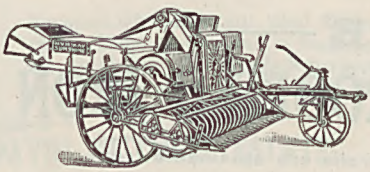

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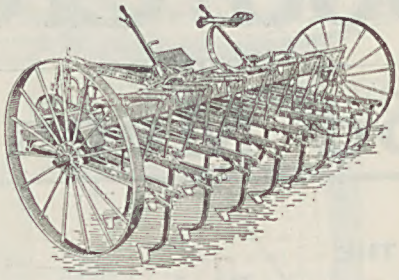

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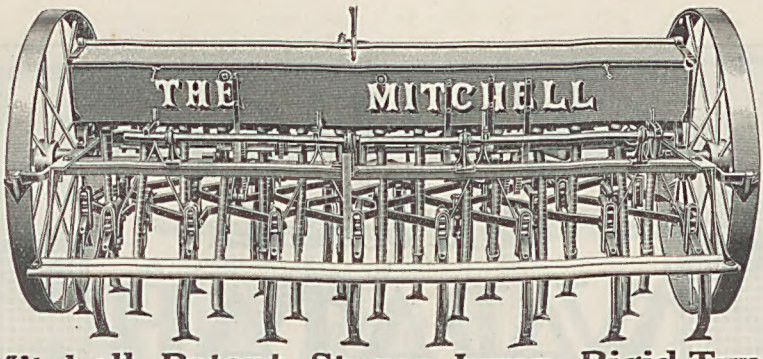

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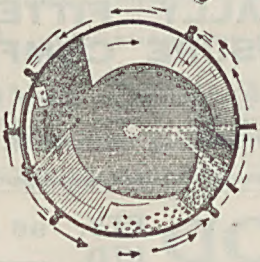

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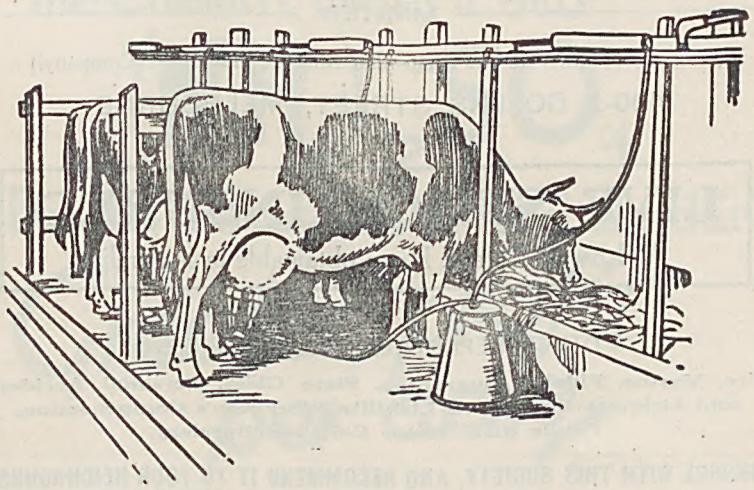

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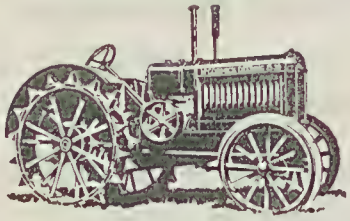

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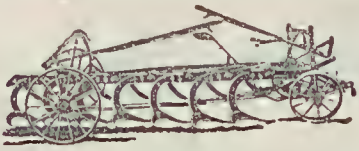

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Vol. XXVI. February, 1928. Part 2.

TECHNIQUE IN FIELD TRIALS.

Paper read by H. A. Mullett, B.Ag.Sc., Superintendent of Agriculture, Department of Agriculture, Victoria, before the Association for Advancement of Science, Hobart Meeting, 1928.

Accurate measurements and trustworthy observations are fundamental prerequisites of all scientific experiments, and it is not too much to say that the progressive development of any experimental science is largely bound up with the degree of technical precision that can be brought to bear upon experimental work, especially in respect to the provision of adequate control of the variable factors involved, and in the measurement of the end point.

The high standing of Chemistry and Natural Philosophy as sciences, just to name two of them, must be largely attributed to the fact that workers have found it possible to devise fully controlled experiments in which effective use can be made of such highly developed instruments of precision as the chemical balance, the thermometer, the chronometer, to name a few at random.

In agriculture the presence of the biologic factor complicates the problem, and very often renders the provision of adequate controls difficult. The time, often twelve months, sometimes longer, required to complete the experiment, limits the number of observations that can be made, and is apt to blunt the perception of the researcher. The material is not often homogenous, and hence sampling is difficult.

Despite these natural obstacles, many splendid advances have been made, and they are generally associated with brilliant experimental technique. It cannot be denied, however, that progress in some branches of agriculture is slower than we would wish it. The work is often carefully planned, results regularly obtained, but they are not wholly satisfactory. Year by year fresh work is hopefully undertaken, but somehow finality eludes us.

Much work is in that condition. What is the reason? In how many instances does failure to recognize imperfection in the technique constitute the limiting factor to fresh advances?

One direction in which the technique of research in this country is long overdue for reform is the method of conducting experiments in which the measurements of the attributes of growing plants are involved, and in these I would include ordinary field experiments, as well as those conducted with plants in green-houses and in pots. Experiments of this type at one stage or other enter very largely into almost every branch of research in agriculture. Perhaps the most common form of field experiment is the yield trial, and it is one with which I am familiar, and for these reasons I would like to deal more specifically with that aspect of the problem.

In stating my belief that they need reform, I do not wish to be regarded as ranging myself with those who say that the single and duplicate plot methods commonly used in yield trials are entirely useless and utterly misleading. On the contrary, there is plenty of evidence that they have furnished much valuable data of a kind that has been transmuted in the agricultural community into pounds, shillings and pence. These tests serve their purpose as a sort of coarse-meshed sieve eminently suitable to recover nuggets from the soil so long as it contains nuggets. But the fact has to be faced that in many directions most of these have been sieved out, and apparently only the fine gold remains When we wish to recover that, we need a finer-meshed sieve—in other words, a much more accurate method of field experiment.

Fortunately that method is available, and has been available for fifteen or sixteen years. But how many of us have recognized it as an instrument of precision of great value, and of those who have recognized it as such, how many have put it into practical use? I refer, of course, to any scientific arrangement of plots based on the conception that a crop is made up of a series of very variable units, and that accuracy requires that sufficient plots of each subject of comparison shall be laid down in such a way as to ensure that on the average they represent a true random sample of the whole. The arrangement, moreover, is one which permits of the degree of accuracy of the results being calculated statistically, and consequently of its being appended to the published results. This information at present is absent from 99 per cent. of the published results of agricultural experiments in Australia.

It has often been urged, more especially of the wheat belt of Australia, where it so happens that the majority of the field experimental work has been located, that the soil in well-chosen experimental fields is much more uniform than than in other parts of the world. True, the crops appear to be uniform, but a test of a fundamental nature conducted with wheat at the State Research Farm, Werribee, in 1926-27, showed that the variation in an apparently uniform acre of that crop was subject to precisely the same type and degree of variation as was a similar acre of wheat at Rothamsted, England, examined in a similar test some years ago.

This investigation was supplemented by a critical survey of a number of specially designed plots laid out in at least five centres in the Victorian wheat belt last year. The result of the work was to invite the

conclusion that where the design of an experiment is such that comparisons are desired between single or duplicate plots, and the average yields of two or three check plots, the results for any year are not dependable unless the yields differ from those of the check plots by 15 to 20 per cent.

Most of those who conduct yield trials in Australia have been relying on this method of experimentation which is obviously not suitable to readily detect differences, say in a 25-bushel crop of wheat, of less than 5 bushels an acre, unless the experiment is continued long enough for chance soil and seasonal variations to have been eliminated. Nowadays differences of that sort are very rare, and one cannot wait ten to fifteen years for reliable results.

The plant breeder lately has been so energetic in bringing new hybrids into the world that he wants finality in three years, and he wants an accuracy in any year of at least 5 per cent. Perhaps it is the absence of reasonably precise methods of comparing wheat varieties that is responsible for the fact that, despite twenty years' work, we still grow 250 varieties commercially in Victoria. In one district alone 30 varieties are grown, and of these fifteen were produced during the last fifteen years. If each of these constituted even 1 per cent. advance on the last, one would not need a very accurate yield test to establish consistent differences between the old and the new, but with some of them one does. Given time, the single-plot system is capable of detecting the *élite* varieties, but its weakness is that it does not eliminate the more numerous mediocre ones if they happen to be lucky.

It was primarily with a view of devising an instrument of precision for measuring in the shortest possible time in all parts of the State, the yields of all new crossbred wheats raised at the State Research Farm, Werribee, and for the elimination of all not superior to standard varieties, that a careful check of the more important of the plot designs dictated by statistical considerations was undertaken.

As the first stage of this work, in 1926 it was arranged that the classic experiment of Hall & Mercer at Rothamsted in 1911 should be repeated with suitable modifications. The work was carried out by H. C. Forster and A. J. Vasey, and the results formed the subject of a paper by them communicated to the Royal Society of Victoria in October. The fact that that body only publishes half yearly is my excuse for reference to the paper here.

An apparently uniform acre of ripe wheat on the farm was subdivided accurately into 160 parts. Each lot was carefully garnered and threshed. The results showed that the lowest yield was 108oz. and the highest 164 oz., the mean yield being 136.5 oz.

The group frequency at intervals of 4 oz. showed that, had only a single plot in that field been chosen for comparison in an experiment, the chances were 2 in 160 that the yield would be between 107 and 111 oz.; 1 in 160 between 112 and 116; 12 in 160 between 117 and 121; 18 in 160 between 122 and 126; 18 in 160 between 127 and 131; 32 in 160 between 132 and 136; 29 in 160 between 137 and 141; 24 in 160 between 142 and 146; 11 in 160 between 147 and 151; 7 in 160 between 152 and 156; 5 in 160 between 157 and 161; 1 in 160 between 162 and 166.

These results are of the same type as those at Rothamsted, and obviously are characteristic of those where the variations are the result of chance, and to which the well-known statistical formulae apply. The

degree to which reliance on one or two plots of the size named is likely to be misleading also is apparent.

This material was worked up after the method of Hall and Mercer, and by combining the units two at a time, three at a time, and so on, it was possible to compare statistically for accuracy the yields, and to arrive at the size of plot, the number of replications, and also the shape of the plot likely to give the most accurate result in practice.

The conclusions of the authors were strikingly in agreement with those of Hall and Mercer. The main ones were:—

That the optimum size for field trials for cereals under conditions such as these is 1-40th acre.

That there would appear to be grounds for the belief that a long narrow plot is the more desirable for field trials.

That the error attaching to a 1-40th-acre plot is diminished to a working minimum by a replication of five times in any one series.

In order to test the value in practice of plots designed in conformity with this data, variety plots each about 1-40th acre, and replicated from 5 to 8 times, were laid down at the State Research Farm, Werribee; at the State Experimental Farm, Rutherglen; at the Departmental Experimental Plots, Longerenong College, and at three other centres. The Beavan half strip method was adopted in its entirety at Werribee, but various modifications were tried at the other centres.

Investigations were also instituted into various minor phases, such as what is the least departure from current practice in respect to spacing of plots, &c., that will give a reasonably accurate result.

Side by side with this the normal method of experimentation was maintained for the purpose of comparison.

The whole of the results were not available when this paper was written, but sufficient are quoted to illustrate the type of result obtained.

At Longerenong five varieties were compared, with Federation as a standard, in plots one-fiftieth of an acre, eight times replicated. The plots were 1-25th of an acre when seeded, but subsequently were divided into two equal parts just before harvest. Significant results were obtained in only two instances, Wannon and Nizam, which both yielded better than Federation. The results are as follow:—

Variety.	Yield.	Control.	Yield of Control.	No. of Replications.	Increase or Decrease over Control.	Odds on Significance
	bush. per acre.		bush. per acre.		bush. per acre.	
Wannon ..	25·90	Federation ..	22·15	8	+ 3·75	2,000 : 1
Nizam ..	27·97	,, ..	26·31	8	+ 1·66	55 : 1
Mogul ..	23·74	,, ..	22·76	8	+ ·98	10 : 1
Free Gallipoli ..	24·10	,, ..	22·44	8	+ ·66	13 : 1
Ghurka ..	24·06	,, ..	23·55	8	+ ·51	5·6 : 1

The variation in the average yields of the check plots is an indication of the lack of uniformity quite common on soils of this type. It is only noticeable in the crop, as the soil appears quite uniform.

The yields of the same varieties grown in two single half-acre plots, with controls of Federation every third plot, are appended:—

Wannon	.. .. ..	17·3 bush. per acre.
Federation	.. .. ..	20·8 ,,
Ranee	.. .. ..	22·9 ,,
Ghurka	.. .. ..	21·0 ,,
Federation	.. .. ..	16·9 ,,
Nizam	.. .. ..	19·9 ,,
Free Gallipoli	.. ..	21·2 ,,
Federation	.. .. ..	19·7 ,,
Mogul	.. .. ..	21·9 ,,

The check plots show a range of variation of 3.9 bushels an acre, an indication of the soil variation. Interpreting these results in the customary way, one would say that Wannon had been out-yielded by Federation, and indeed by every other variety in the trial, a result the opposite of the replicated test.

Assuming the latter test the only one conducted, Wannon would be regarded as having failed this year, but as there are no means of proving this, the experiment must be continued for an indefinite period until all possibility of chance soil variation has been removed by hit and miss methods, say ten years hence, by which time all interest in Wannon may have disappeared.

At the State Farm, Rutherglen, Free Gallipoli, Turvey, Major and Yandilla King were compared with Federation as a standard, in plots 1-60th of an acre eight times replicated (really 1-30th-acre plots equally divided). Significant results were obtained in three of the five comparisons. The full results are as follow:—

Variety.	Yield.	Control.	Yield of Control.	No. of Replications.	Increase or Decrease over Control.	Odds on Significance.
	bush. per acre.		bush. per acre.		bush. per acre.	
Free Gallipoli..	42·8	Federation ..	44·1	8	— 1·3	7 : 1
Turvey ..	40·8	,, ..	42·2	8	— 1·4	13 : 1
Major ..	41·1	,, ..	42·2	8	— 1·1	32 : 1
Yandilla King	37·3	,, ..	40·0	8	— 2·7	172 : 1
Currawa	35·2	,, ..	40·9	8	— 5·7	1,220 : 1

The data obtained from the units of comparisons of any of these replicated tests may be grouped together, affording interesting sidelights on the results that might have been obtained had larger and fewer plots been used. Thus, taking the figures for Federation and Major, and grouping them in pairs to obtain 1-15th-acre plots, we get the following conflicting results:—

Federation	.. .. ..	43·0 bush. per acre.
Major and Federation	.. .. ..	39·9 ,,
Major	.. .. ..	41·6 ,,
		42·6 ,,

Had such a result been obtained in a single or duplicate plot experiment, only a good publicity man could make anything of it. On the other hand, in the replicated experiment Major has been shown definitely inferior to Federation under the conditions of the experiment.

As an example, where quite satisfactory uniformity has been obtained in single-plot experiments, the results of a series of 1-9th-acre plots at Rutherglen, conducted in the same year, may be cited. The single plots were arranged between pairs of check plots of Federation.

Variety.	Yield.	Average of Two Adjacent Check Plots.	Increase or Decrease over Check.
	bush. per acre.	bush. per acre.	bush. per acre.
Federation	28·7		
Free Gallipoli	31·2	29·3	+ 1·9
Federation	30·0		
Turvey	26·1	29·9	— 3·8
Federation	29·9		
Major	25·8	29·2	— 3·4
Federation	28·6		
Yandilla King	22·8	28·9	— 6·1
Federation	29·3		
Currawa	18·9	28·7	— 9·8
Federation	27·5		

In respect of those varieties to which there was significance attaching in the replicated trials, it will be observed that the order of yield is the same, viz.: Federation, Major, Yandilla King, Currawa; but the figures are not nearly so convincing, where small differences separate the yields, because there is nothing to guarantee the uniformity of the soil on which the single plots were sown. Nevertheless, this type of single-plot experiment is apparently superior to that where only a few check plots are provided.

At Werribee the harvest has not been threshed, consequently the complete results are not available. An example of the result of the replicated trial, which promising new crossbreds have to successfully pass, is furnished; also one where a new selection is being tested.

Variety.	Yield.	Control.	Yield of Control.	No. of Replications.	Increase or Decrease over Control.	Odds on Significance.
	bush. per acre.		bush. per acre.		bush. per acre.	
New crossbred— Currawa x Major x Gallipoli ..	17·33	Free Gallipoli	19·80	8	— 2·47	1,000 : 1
New selection— Rajah 228 I	24·00	Rajah ..	22·92	8	+ 1·08	84 : 1

The new crossbred failed to justify itself this year, but significant results were obtained in the cause of the selection.

After consideration of the whole of the data obtained during the past few years, one cannot but conclude that the replicated system of plots is essential to accuracy. This system involves much more work with yield trials, but need not be used except where critical tests are desired. The Victorian Department of Agriculture proposes to eliminate largely the weighing of small plots where there is no possibility of the result being really significant, and it will make larger use of the system where single plots are interposed between pairs of check plots. When these indicate phases of the work worth more elaborate test, properly replicated treatment will be substituted. The futility of attempting to tackle too many aspects of a problem at once has been recognized.

The advantage of expending the whole of the effort on one or two aspects of a problem at a time has been demonstrated. The slogan is: Concentrate—replicate.

APPENDIX.

(1) Sample Calculation of Replicated Yield Trials, Departmental Plots, Longerenong College, 1927. By Student's Method.

	Control—Federation.	Variety—Wannon.	Difference.	d	d^2
	bush. per acre.	bush. per acre.	bush. per acre.		
	23·25	25·75	+ 2·5	− 1·25	1·55
	21·20	25·0	+ 3·8	+ 0·05	..
	22·40	24·0	+ 1·6	− 2·15	4·65
	21·6	24·0	+ 2·4	− 1·35	1·83
	22·4	28·25	+ 5·85	+ 2·10	4·41
	22·8	25·0	+ 2·2	− 1·55	2·41
	20·3	27·4	+ 7·1	+ 3·35	11·25
	23·25	27·8	+ 4·5	+ 0·8	0·64
Totals ...	177·20	207·2	+30·0	..	26·74
Mean ..	22·15	25·9	+ 3·75	..	..

Using the formula—

$$\sigma = \sqrt{\frac{\Sigma d^2}{n}}; \quad Z = \frac{M}{\sigma}$$

[M = the mean difference. d = the algebraic sum of each individual difference from M],

$$\text{We get} \quad \sigma = \sqrt{\frac{26.74}{8}}$$

$$= 1.83$$

$$\text{therefore} \quad Z = \frac{3.75}{1.83}$$

$$= 2.05$$

Where Z = 2.05 and $n = 8$, the odds on the significance of the difference are 2,000 : 1 that Wannon is superior to Federation by 3.75 bushels per acre.

VINEYARD TILLAGE.*

By F. de Castella, Government Viticulturist, Victoria.

The imperative need for adequate tillage of vineyards, if reasonable yields are looked for, is so generally recognized, and has been admitted for so many centuries, that further advocacy of it would almost seem to be uncalled for.

Lack of sufficient attention to the working of the soil is without doubt the most serious crop-limiting factor in Victorian vineyards, more important even than neglect of manuring or faulty pruning, serious though the results of these last two may be.

It is the grower who works the soil thoroughly and often, maintaining the whole surface in loose tilth, especially during the growing period of the vine, who vintages heavy yields. The contrary is also true—vineyards allowed to become hard and compact at the surface are usually unprofitable to their owners unless perhaps in an exceptionally favorable season. Economy in the working of the soil is false economy as many have found to their cost.

Though the need for tillage is generally admitted there is much less agreement concerning the manner of its execution. Some favour deep cultivation whilst others hold that it should be limited to a shallow depth. Some indeed consider its sole object to be the suppression of weeds; there are even extremists who deny the utility of soil working and advocate what is termed in French in-culture, or the absence of tillage. Such views have occasionally been advanced in Victorian vine districts, but their practical application has had disastrous results.

If we turn to world-wide vineyard practice we are faced with a mass of conflicting evidence, recognized authorities holding views which in some cases are altogether contradictory. The object of the present paper is to endeavour to reconcile these conflicting views and to indicate the system of working the soil that will give the best results in our Victorian vineyards.

A lengthy statement of the generally accepted benefits of tillage and the manner in which these are brought about, would here be quite out of place. I take it that the familiar explanations to be found in all agricultural text-books meet with general acceptance, notwithstanding some recently published opinions to the contrary. Expressed in briefest terms, tillage facilitates the absorption of rain water, retains soil moisture during the dry season, and provides aeration, so essential biologically and otherwise, to soil and sub-soil.

The question confronting us is: What is the best system of tillage for Victorian vineyards?

In the older vine-growing countries of Europe it has been answered by the experience of centuries. Each locality has thus evolved the cultural programme best suited to its special requirements. These time-honoured practices are usually sound guides. Pasteur has written, "Is it not likely that each locality has arrived at a sort of relative perfection in the practices that it has found necessary? I incline willingly to the

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belief that century-old usages have more or less their *raison d'être* in the very nature of things " (*Etudes sur le vin*, p. 24).

In Australia we have not this advantage; our experience is only in the making. The conflicting evidence demands careful examination in the hopes of elucidating the basic principles, avoiding partisan advocacy of any particular method.

Brief reference to some of the differing opinons held in France will be helpful. The national importance of the vine industry and its centuries of experience naturally lend weight to French views on viticultural questions. In some cases these divergent views are capable of explanation by climatic differences, but not always.

Shallow or Deep.

French vineyard practice distinguishes between winter and summer cultivation of vineyards. In the warm South of France it has long been the usage to plough deeply in winter and to work the soil to a lesser depth in spring and summer. It is concerning the depth of the winter ploughing that opinions differ most. An interesting controversy raged in France some twenty years ago, when the advocates of *La Culture Superficielle* denounced southern French methods, and contended that loosening the surface to a very shallow depth was all that was required.

These views were not new. So long ago as 1868 Dr. Guyot, then the leading vine authority, wrote, " Cultural operations for vines should all be executed on the level and they should always be very shallow, the tilth should not exceed 10 centimetres (practically 4 inches) in thickness unless it is necessary to extirpate parasitic plants that would not be reached at that depth. The vine neither admits mounding up nor opening out, which upset the temperature and moisture of its rootlets. It likes a soil that is firm, and even hard; it grows best alongside trodden paths, and experience shows that it becomes sterile in proportion to the depth of soil working forced on it.

" The recent theory of deep cultivation which may suit carrots, beetroot and lucerne, does not apply to the vine, any more than it would apply to forests. Deep cultivation troubles the vine profoundly. . . . To keep the soil loose and bare on the surface, to gather the nitrogenous products of the atmosphere and absorb dew, and further, to entirely destroy weeds, these are the only points useful to the vine.

" One working after pruning, another in mid-May (November here), a third at blossom or just after and a fourth when the fruit is about to change colour, constitute an excellent maintenance for the vine. ' A working is worth a watering ' say the vignerons, and it is the truth. Stirred soil actively absorbs moisture at night and dew in the morning."

In an earlier work he expresses the opinion that the vine is better suited by a firm and beaten soil than by one that is light and often stirred—in support he points to a beaten pathway through a block of vines which is well known to be a condition of vigour and health for the vine rows on either side of it.

In striking contrast is the opinion of Henri Marès, the well-known authority of Southern France. Writing in 1864, he pointed out that whilst two workings are absolutely indispensable, the first between January and March, and the second from 15th May to 24th June (in Europe), they are not sufficient. It is necessary to interpose a third one.

"The first ploughing should stir the soil more deeply than the others; it descends on an average to 20 centimetres (7.87 in.). When badly executed and too superficially, the soil does not loosen enough and at the first dry weather it loses the moisture so necessary to the vine to resist the heat of summer.

"The second working is that of the month of May. It aims at destroying many weeds and maintaining the tilth of the first ploughing; it should thus penetrate nearly as deeply.

"The third working is destined to break the crust resulting from the late spring rains and to kill weeds. The soil is thus well loosened and cleaned. It need only be superficial—8 to 10 centimetres (3.15 to 3.94 inches) Previous workings have loosened the ground more or less deeply, the last one loosens its surface and permits it to retain, all the summer, the moisture the vine needs."

Further he states, "The loosening of the soil must reach a certain thickness to preserve the coolness of the layers in which the roots develop." When the first workings have not penetrated deeply enough, reaching only 4 or 5 centimetres instead of 18 to 20, the soil hardens beneath; implements slip over it as though it were paved, and at the dry and hot period it cracks deeply and dries out. The development of fruit and canes is checked, the leaves fall, and the grapes become sunburnt." Concerning the question of deep or shallow tillage, he continues, "To assert that the vine only demands very shallow working, as has been done recently, is to judge the question for cool climates where frequent rains refresh the soil and atmosphere, and for light, easily worked soils. From the point of view of hot and dry climates and strong soils, conditions usual in the southern region, it is a mistake. . . . ."

The two first workings should penetrate deeply enough without however injuring the vine roots. This is achieved by descending on an average to 18 or 20 centimetres, only the third working should be superficial."

Marès holds that in addition to these three regular operations the vineyard will benefit from "one or several supplementary shallow workings, after rains that provoke continual growth of weeds in well manured land, and so as to keep the soil in a free and moist condition, favorable to the good development of the grapes."

Many other opinions might be quoted for and against deep cultivation. These two will suffice. The conflict between them is very striking. The part played by climate is no doubt considerable. Guyot's home was Burgundy, in cool Northern France; Marès, on the contrary, wrote for the warm South. It is worth noting that the deep winter cultivation championed by Marès is the cultural method which, in conjunction with heavy manuring, has for generations been the established practice in the region where the world's heaviest wine crops are vintaged.

In this region it is customary to plough young vines very deeply so as to deliberately suppress the bulk of the roots near the surface, compelling the vine from its youth to depend on its deeper roots. This in addition to the deep subsoiling invariably executed before the planting of the vineyard, assures to the vine a root system differing considerably from that of a vine planted without previous subsoiling and subjected to shallow subsequent cultivation.

Likewise at Jerez, the Sherry district of Southern Spain, where the vineyards are most carefully worked by hand and where climatic conditions are even more like Northern Victoria than is Southern France. Here deep winter cultivation is the time-honoured rule, the ground being completely turned over to a depth of nine inches in November and December (early winter). The work is executed in such a way that each vine occupies the centre of a small basin, the banks of which separate it from the adjoining basins. In this way no winter rain can run off the land; it is all absorbed into the sub-soil.

The land is worked level in February, and again in April-May (spring). After ths, only superficial hoeings are given, the soil surface being brought to a very smooth state, great attention being paid to tapping with the flat of the hoe to close cracks which form readily in the stiff chalky soil.

Deep winter cultivation of vineyards certainly has the sanction of the centuries. Columella wrote in the first century of the Christian era, "Vines must be unearthed after the ides of October (15th April in Australia) and before the cold weather. This operation exposes the small roots that grew during summer. The well-advised husbandman severs them with the iron (spade) because if he let them become strong those below them would weaken. As a result the vine would send out, at the surface of the land, roots exposed to be devastated by the cold or scorched by the heat to such an extent that the mother (vine) would not fail to be too thirsty at the dawning of the dog days. This is why, when the vines are unearthed, all roots must be cut that have grown at less than a foot and half of depth."

"The vines must be unearthed each autumn during the first five years until they are in all their strength, but once their trunk shall have accomplished its growth this operation may be done only about every third year, as much because, in this way, the vines will be found less often injured by the iron, as because it takes more time for the vines to throw out these small roots when their trunk has acquired size. Vines must be very deeply dug before they sprout."

Shortly after the publication of the contradictory views of Guyot and Marès, phylloxera made its appearance in Europe. In the struggle for the very existence of the vine industry, reconstitution and the raising of suitable resistant stocks overshadowed all other considerations and the controversy concerning the depth of cultivation was forgotten. Vineyard tillage generally resolved itself into winter ploughing to a depth varying with the climate, supplemented by spring and summer workings of a shallower nature.

The controversy was revived in 1900-1905, when several writers emphatically condemned deep working of the vineyard soil, mainly on account of the mutilation of the roots near the surface that it entails. Mere surface scratchings to a depth of less than half an inch were recommended in replacement of ordinary cultivation, the number varying according to the development of weeds. Some, indeed, went so far as to recommend "in-culture," in other words, the elimination of tillage altogether, considering suppression of weeds to be the only useful purpose it served. Oberlin, at Colmar (Alsace) covered the soil surface with a layer of clinker 4 inches deep, in which few weeds grow, and their destruction is easy. These clinker-covered plots yielded more grapes than normally tilled controls.

Experiments on similar lines followed, not only in cold Northern France, but even in regions as warm as Algiers and Tunis, several of which have become classic. Tillage was reduced to surface scratching, less than half an inch deep, and yet plots so treated yielded more than normally cultivated controls.

Notwithstanding these surprising results the highly productive region of Herault Department, adhered to its traditional tillage methods, as described by Marès in 1864. Superficial culture, however, became a burning question. It was reviewed at some length by Degrully and Ravaz in a pamphlet published in 1905, with the following conclusions:—

1. Young vineyards from plantation until three years old should receive good ordinary ploughing. The first roots all originate deeply, and it is of the highest importance to facilitate the aeration of the layers in which they develop.
2. For older vines, experience has shown, so far, that shallow tillage is preferable to deep in all compact, moist, or medium soils. It must not be forgotten that it is only fully effective when it prevents weed development. Shallow tillage has proved equally advantageous in sandy coast lands, very dry at the surface, but where the water-table usually establishes itself at a shallow depth.
3. On the other hand, our calculations and experience show that in dry, pebbly, very permeable soils, where the water-table is very far down, where, in consequence, the roots also tend to establish themselves in the deeper layers, deep ploughing remains indicated and should give better results than systematically shallow tillage.

Maroger's "Continuous Culture".

The most striking contribution of recent years was made by the late E. Maroger. His methods are outlined in considerable detail in a book entitled *La goutte d'eau* (The drop of water) published in 1924. The results obtained at his *Livières* vineyard are so remarkable that his somewhat revolutionary methods here merit examination.

Livières is situated in Gard Department of Southern France, between Montpellier and Nimes, but nearer the latter town. The average rainfall is about 30 inches and the vines are not irrigated. This 75-acre vineyard yielded during the seventeen years prior to 1924 the high average of 1,255 gallons per acre, whereas the average yield of his neighbours during the same period was only 525 gallons per acre. As the soil of Livières is not richer than that of the neighbouring vineyards, the heavier yield must be attributed to Maroger's special method of training and cultivating his vines.

The salient features are—

1. Vines (grafted on resistant stocks) planted at a distance apart of 8 ft. 2 in. x 5 feet (rather wider than usual in the region) on land subsoiled before plantation to a depth of 23½ to 27½ inches.
2. High trellising—4 to 6 wires.
3. A special form of long pruning.
4. Moderate manuring.
5. A special shallow tillage method termed continuous culture.

The system of pruning is curious. It resembles the treatment of a loganberry rather than that usually applied to the vine. There is neither main stem nor definitely formed crown. From above the graft, any available canes, growing from the previous season's wood are selected, and four to eight of these are laid down as fruit-bearing rods.

But it is in the tillage of the soil that Maroger's method departs radically from Southern French practice. The usual deep winter ploughing is suppressed. Ploughing is, in fact, eliminated altogether, tillage being limited to workings with the spring tooth cultivator to a uniform but maximum depth of 5 centimeters or barely 2 inches (1.97 in. to be exact) a depth that is never exceeded.

These workings are very frequent. A definite number per year cannot be fixed as so much depends on climatic conditions. Maroger is emphatic that the soil must never be worked unless in perfect condition and not too wet. In some years his vineyard has been cultivated not less than 37 times; on an average 30 workings are given. In some years cultivation is commenced as early as November, just after vintage; in others it cannot be started before the end of winter. During spring and summer, weekly cultivation is the rule, provided the soil is in fit condition.

Maroger sums up the characteristics of a well-worked vineyard as follows:—*No weeds, no clods, no fissures.* He attributes the efficacy of his continuous cultivation method to the following:—

1. More complete absorption of rain water by the soil.
2. Efficient storage of the water thus absorbed.
3. Beneficial influence of aeration on useful micro-organisms—particularly on those that unlock the soil reserves. "The fertility of the soil is intimately bound up with its micro-flora."
4. Stimulation of nitrifying organisms and prevention of protozoa and other nitrogen wasters.
5. Stimulation of direct fixation of atmospheric nitrogen by various organisms. This action, which is notable in extent, is favoured by daylight. It only takes place at very shallow depth, hence the need for continual stirring to bring fresh quantities of soil under its influence.
6. The useful action is not confined to the surface, the sub-soil also benefits indirectly as well as the roots within it.

Maroger claims that his method largely dispenses with manuring. "We have the conviction that the part played by manuring is secondary, as regards yield, whilst constant superficial tillage remains distinctly in the first line. Manures are auxiliaries, soil stirring is the very essence of the health of the vine. Manuring would thus become exceptional, and would only be applied in special cases, judiciously." He gives figures as to the very moderate manuring practised at Livières, where the rule is "Light manuring but heavy crops," and concludes "It is thus evident that our cultivation methods must have special virtues."

Adaptability of the Vine.

From the above it is evident that under widely different cultural treatment vines can be made to yield highly remunerative returns.

From the 8-inch tilth recommended by Marès to the 2-inch limit insisted on by Maroger is indeed a wide range.

How reconcile these apparent contradictions? As will be shown below, it is mainly a question of climate. In cool regions with ample rainfall, where moisture conservation is not a vital question, the vine can be permitted to develop its surface roots, injury to which is avoided by strictly limiting the depth of tillage operations. In warm, dry climates, however, it is preferable to compel the vine to depend on its deeper roots, deliberately cutting those which develop near the surface by a deep winter ploughing.

The Root System of the Vine.

The root system of the cultivated vine differs materially from that of a natural vine raised from seed, the main roots of which originate at the same level. The vines in our vineyards are propagated asexually or vegetatively. Their roots are entirely adventitious, springing laterally at different levels from the original cutting, but mainly from near its base. Academically, the shorter the cutting the better. A single eye cutting results in a root system approximating most to that of the seedling vine. Vineyard practice demands a longer cutting to avoid its drying out before it has properly struck. We plant cuttings 12 inches to 15 inches, and even longer.

These adventitious vine roots originate in the phellogen or cork cambium. According to the investigations of Degrully and Ravaz, they take the shortest cut to the soil, except at the spot where the original cane was severed, this is perpendicular to the surface of the cutting. Gravity exerts its influence, so that the early trend of the young root is diagonally downwards, a direction that cannot obviously continue indefinitely. Various factors intervene, such as excess or deficiency of water, of plant food, of air, the condition of soil and sub-soil. (Sub-soiling before plantation here plays a very important part.) Obstacles, such as stones, &c., may change the direction temporarily. The roots may follow fissures and tunnels made by insects or left where a root of a previous occupant has rotted away. These factors are often divergent, and the result may vary much so far as an individual root is concerned; collectively there is more uniformity, and this irrespective of the level at which the root arises.

Main or primary roots originating near the surface have at first a downward tendency. Those originating more deeply, on the other hand, tend upwards. All the main roots of the vine, whether their origin be shallow or deep, have a tendency to establish themselves at approximately the same level, which is not far beneath the soil surface. This level varies according to circumstances, but is fairly constant for given conditions of climate, soil, and preparation (sub-soiling).

These primary roots give rise to those of secondary and tertiary order, and ultimately to the fine rootlets bearing the absorbent fibrils. Our knowledge is less complete than is desirable concerning these very essential but rather ephemeral organs of the vine that appear in spring but mostly die off or dry out in autumn, leaving scars observable in winter. The date of the first appearance of fibrils varies a good deal. In well aerated warm soils it is contemporaneous with the bud-burst, but in cold compact soils it may be later.

Along the course of the primary roots, occasional plunging roots occur; these dip deeply into the sub-soil and may be compared to the drooping branches of a willow. They play a vital part in the water supply of the vine, especially during the dry season; they are less concerned in the absorption of plant food with the exception, perhaps, of potash. It is the main body of the roots, at a shallower level, that are the feeders of the vine and that absorb the bulk of the plant food which we know to be mainly situate at a fairly shallow depth. It is with these shallower roots that we are concerned in connexion with tillage problems.

A surprising number of roots and rootlets is to be found within 4 inches of the surface, in vineyards when cultural methods permit the vine to thus establish itself. The shallower roots of the vine are always present in abundance without any intervention on our part; it is encouragement of the deeper roots we must aim at in warm climates. Their development is promoted by deep preliminary soil preparation before planting, by deep tillage of the young vine, and by systematic deep winter ploughing, once a year, of vineyards in full bearing.

Does Interference with its Roots Injure the Vine?

Deep ploughing necessarily cuts many vine roots. This is often demonstrated in the vineyard when a ploughing is deeper than that of the previous season.

Does the vine resent such treatment? The answer depends on the time of year when the roots are cut. Being deciduous, its yearly cycle comprises periods of active and latent life. During the active or growing period interference with its roots is harmful and fraught with serious consequences to the fruit crop.

During the latent period, however, when it is quite dormant, the vine tolerates even extensive root mutilation with seeming impunity. Proof of this is afforded by the success attending the sub-soiling of old-established vineyards—a practice becoming popular in the irrigated areas of Northern Victoria. Introduced mainly with a view to facilitating the "taking" of irrigation water by stiff soils, it has the additional and very real advantage of a decided rejuvenating action on more or less worn-out old vines. A similar practice has indeed been followed for generations in certain parts of Italy, where it is known as *Scasso*, to restore vigour to declining vines. It has recently been introduced into the South of France, where it now has many advocates who claim remarkable results.

Percival points out that "mutilation influences the development of the root system, and further elongation is prevented, but the secondary roots make up for the loss by more vigorous growth, and often many adventitious roots arise near the cut end."

Pacottet stresses the important part played by climate. "Root lesions in the south (France) are much less important than in the north. The warm temperatures of southern countries permit the development of abundant young roots, collectively more active than the root on which they originate. In the north, on the other hand, this formation of new roots is much less rapid, and it is well to conserve roots which are always slow and late in forming."

It must be remembered that deliberate root pruning is sometimes applied with beneficial results to over-vigorous vines that grow wood rather than fruit.

Some French authorities question the wisdom of imposing deep winter cultivation on vines not previously accustomed to such, holding that yield may suffer for a couple of seasons, until the plant has adapted itself to the changed conditions. In our warmer climate the change would be less severely felt, unless perhaps by weak vines or in an abnormally dry season.

We may conclude that under the conditions prevailing in Northern Victoria, even severe root interference has little or no depressing influence on the vine provided it is in its dormant condition of latent life, but that any interferences with actively functioning roots must be avoided.

The Artificiality of Viticulture.

The artificiality of viticulture is indeed very striking. We grow the vine and succeed in making it yield abundantly under conditions never intended for it by nature. The vine is not a desert plant; it is indigenous in regions where the soil is deep and well supplied with moisture without any special cultural treatment, and yet we succeed in making it thrive in semi-arid soils.

In order to overcome the phylloxera menace, we are compelled to graft it on resistant stock; in other words, to make it grow on roots not its own. By nature a creeper, we train it more as a bush or shrub—a trailing one, it is true, when trellised on wires. We give it an unnatural utilitarian shape which is a continual struggle against the creeper nature of the plant, and at pruning time we mutilate it more perhaps than any other fruit-bearing plant.

Nor does artificiality cease at the soil level. Even its roots must, in warm, dry climates, be artificially confined to a deeper region of the soil than that favoured by the nature of the vine. The proximity to the surface at which we can permit the roots to function depends on various factors, but mainly on climate. In some cases we can allow them to develop within 4 inches of the surface, and even less; whilst in others they must be kept at a deeper level.

The Crux of the Question.

It would, indeed, appear that, given a sufficiency of moisture, the vine will give its maximum yield if tillage be reduced to mere surface scratching of the soil. Under these conditions the roots establish themselves in large numbers quite near the surface where the soil is richest. Here they function under optimum conditions of abundant plant food, temperature and aeration. Where soil moisture permits, the vine can with advantage be allowed its natural root system, and consistently shallow tillage will give the best possible results. Maroger obtains his remarkable yields under a 30-inch rainfall. But in warm climates with scanty rainfall, we cannot safely conduct our vines in this natural way, since adequate moisture cannot thus be ensured. The roots near the surface would suffer during a dry spell. Even under irrigation, in the interval betwen two waterings, the surface soil becomes

too dry for their normal functioning. For reasons of moisture conservation, it is essential to establish and maintain a dust mulch of some 6 inches in thickness. Hence the expediency, under dry conditions, of sacrificing the roots near the surface, artificially modifying the normal root system and deliberately cutting, once a year, all those above a certain depth by a winter ploughing executed to this depth. In Northern Victoria this depth is in the neighbourhood of 8 inches. Though we deny the roots access to the richer surface layers, the vine nevertheless obtains adequate plant food. The annual turning over mixes the soil to the depth of the winter ploughing. The more plentiful plant food released and absorbed at the surface is thus made available, in due course, in the region where we artificially compel the roots to function.

It is imperative that the annual deep ploughing be executed whilst the vine is dormant and when its roots may be cut with impunity. Postponement until the awakening of the vine's activity in spring would imperil the coming grape crop.

Winter ploughing should be early. Though at any part of the dormant period, root cutting is equally harmless, its early execution presents other advantages. Winter rains are better retained. Aeration exerts its benefits over a longer period. A soil may be in bad condition for ploughing at midwinter that was in excellent order some weeks earlier.

Early winter ploughing is almost equivalent to fallowing, the benefits of which are known to us all.

Concerning spring and summer tillage, there is much less disagreement. All competent vine-growers admit the value of frequent soil working to a moderate depth. Obviously the tilth established by the winter ploughing must be maintained and perfected by adequate later cultivation. Frequent summer working is becoming increasingly popular in Victorian vineyards, a tendency that receives strong support from the sensational results of Maroger's continuous culture outlined above. Stirring to a greater depth than 2 inches, however, is necessary in our drier climate, which must require a deeper mulch than suffices in Southern France. A deep winter ploughing permits the maintenance of a 6-inch mulch without any interference with actively functioning roots.

There are times when working of the soil should be temporarily avoided, if too wet, for example, when it would become compacted and form clods instead of being rendered loose and mellow. At certain critical periods of the vine's growth it is also well to suspend tillage operations. When spring frosts are to be feared and when the vine is in blossom, the lower temperature in proximity to newly worked soil aggravates the risk of injury at these times; likewise in connexion with certain vine fungi. During a heat wave cultivation sometimes results in sun scald, and its execution may be attended with risk.

Whatever the depth of tilth that may be found most satisfactory it is essential that it should constitute a complete covering over the whole surface. An insufficiently worked strip, between the vines in the row, detracts enormously from the value of even perfect tillage in the interval between the rows.

Victorian Experience.

It is regrettable that the problem has not yet been tested experimentally in Victoria. We have here a fruitful field for viticultural research. Nevertheless, from a careful inspection of the vineyards of the whole State, useful conclusions can be arrived at.

The evidence in favour of thorough tillage is overwhelming. Whether the land be irrigated or not, it is the well-worked vineyards that yield heavy crops. True, the efficient grower is the one who cultivates most; the other factors such as pruning, manuring and disease control receiving due attention, the whole supplement of crop may not be due to better tillage alone. It is, nevertheless, safe to affirm that in unprofitable vineyards inadequate tillage is the chief yield-limiting factor.

In the unirrigated areas where vines are grown for wine production, spring and summer cultivations are more frequent to-day than formerly, with marked benefit to the yield. In many cases, however, winter ploughing is not quite so deep as would seem desirable; it is seldom executed to a greater depth than 6 inches, and is often shallower. There appears to be room for improvement in this direction. In some cases it is not early enough—late winter rains sometimes compel its postponement until undesirably late, when active roots must be cut. Ploughing in early winter, or even late autumn, would obviate such postponement.

One of the commonest mistakes is partial tillage. The intervals between the rows may be well worked, but the strip of land between the vines in a row and under the trellis wire receives insufficient attention; obviously this strip should be tilled as thoroughly as the rest of the ground. The mulch of loose soil must be continuous.

It is in the Victorian irrigation areas, however, that the most decisive evidence in favour of thorough and deep tillage is forthcoming. Mildura is one of the oldest irrigation settlements in Victoria and one where the culture of the vine has reached a high state of efficiency. Here the need for early and deep winter ploughing is more and more recognized. On the best-conducted vineyards double and multi-furrow ploughs are now discarded for the first winter ploughing, for the reason that they do not work to a sufficient depth. This operation is executed with the single-furrow plough, which readily penetrates more deeply. The extra cost entailed has been found well worth while. Ploughing in winter to a depth of 9 inches, and even more, is not uncommon.

The mistake is sometimes made of ploughing rather shallow in winter and increasing the depth at subsequent ploughings, as the working of the soil becomes easier. This may lead to deep working in spring, roots being cut at a time when all interference with them should be avoided. The first ploughing should be the deep one, the others being shallower.

Spring and summer cultivations, necessarily to a shallower depth, usually receive proper attention, the timing of the different operations depending, of course, on the dates of waterings.

Though irrigation problems are foreign to the present paper, irrigation and tillage are to a large extent interdependent. That the latter must follow the former at the earliest moment practicable is, for example, an irrigation axiom.

It is remarkable that widely dissimilar irrigation programmes may lead to much the same result in the way of yield. Some favour frequent watering; others apply it seldom.

Our knowledge is very incomplete concerning the optimum soil water content at different periods of growth. It would seem illogical, however, to encourage exuberant growth after midsummer. The leaf surface must, of course, be sufficient to bring the fruit to perfection and to store in the old wood the reserves needed to start the following season's growth. More than this would seem unnecessary and undesirable. We grow vines to produce grapes, not canes and leaves in needless profusion.

There is a marked tendency in our best irrigated vineyards to apply less and less water but to increase the working of the land. In other words, fewer irrigations, but penetrating deeply into the sub-soil and more thorough tillage.

Practical Considerations.

The actual application of the above principles may be accomplished in various ways. Local conditions must receive their due consideration. In the majority of cases the following programme will be found entirely satisfactory in trellised vineyards, irrigated or otherwise.

Plough deeply with the single-furrow plough as early in the winter as practicable, gathering the soil to the centre of the interval between the vine rows. In order that the whole of the soil may be stirred, a deep furrow should first be opened down the centre of the interval, the plough returning almost in the same furrow, so as to turn the earth that has been covered by the first sod. The subsequent furrows are all away from the vine, leaving only a narrow strip uncultivated between the vines in the row.

This strip must be entirely thrown out into the interval, either with the horse-drawn "grape and berry hoe" or with the hand hoe. To merely skim its surface with the long-handled shovel, as is sometimes done, is faulty practice.

In early spring the earth thus gathered to the centre is gradually worked back to the vine, either with a multi-furrow plough or a disc cultivator, so as to fill the depression, whence the strip was hoed out, with loose soil, and leave the vineyard surface level and loose. Subsequent cultivation is executed with spring tooth disc or such other types of cultivators as may prove most efficient for the type of soil with which one has to deal.

Should green manuring be practised, some modification is necessary, the deep ploughing being advanced a few weeks. There is no objection to the root cutting it entails, in late autumn, when the vine has completed its active life. No fresh roots will grow before spring. It is far better to thus advance the date of the deep ploughing than to postpone it until the ploughing-in of the cover crop, when there is grave risk of injury to functioning roots. The cover crop itself will benefit from being sown on deeply worked soil.

Early winter ploughing is inconvenient on hillside vineyards, the soil of which is liable to scour with winter rains, or where, as is sometimes done, the growth of weeds is permitted in winter so that they may serve as green manure when ploughed in. In such cases ploughing may be postponed until the end of winter. It is well, however, to see that it is not unduly postponed and that it is executed before the

awakening of the vine roots, and to seriously consider whether the benefits really outweigh those to be derived from ploughing in early winter.

Summary.

1. That adequate tillage is an essential factor of vineyard production is generally admitted, but opinions differ greatly concerning important details of its execution.

2. Deep winter ploughing, supplemented by shallower working in spring and summer, has the sanction of the centuries in Southern Europe. It is still the general practice in the region of Southern France where the heaviest wine yields are vintaged.

3. Deep ploughing has been criticized, chiefly on account of the root injury it entails. A controversy between the advocates of shallow and deep tillage, at the beginning of this century, aroused much interest. The former proved experimentally that heavy yields could be obtained with mere surface scratching.

4. The "continuous culture" recently advocated by Maroger merits special attention. Ploughing is eliminated and tillage consists of frequently repeated workings to a depth not exceeding 2 inches, about 30 of which are executed in a year. Despite only moderate manuring, very heavy yields are vintaged from rather poor land. The rainfall averages 30 inches.

5. The vine can adapt itself to widely different cultural treatment. If rainfall is sufficient, surface rooting may be permitted, but under dry conditions, the natural root system can with advantage be modified, so that the vine will depend on its deeper roots.

6. The natural root system of the vine consists chiefly of more or less horizontal roots, with occasional plunging roots originating from them. The bulk of the roots tend to establish themselves at a fairly uniform but moderate depth varying with several factors. In dry regions a deeper root system is artificially built up by cutting those roots which develop near the surface.

7. More particularly in warm climates, the vine tolerates root interference with seeming impunity, provided that it is effected during the dormant winter period. The same interference with active functioning roots is decidedly injurious. Root pruning often benefits the vine by promoting the development of young roots, collectively more active than the portion of old root they replace.

8. The depth of tillage is largely a question of climate. Given a sufficiency of moisture, shallow culture will result in the maximum yield, the roots functioning in the richer surface soil and under optimum conditions of temperature and aeration. In dry climates the need for moisture conservation compels a modification in the natural root system, sacrificing the roots near the surface and deliberately cutting them whilst in their dormant condition by a deep winter ploughing. Spring and summer workings to a shallower depth maintain and perfect the tilth thus established.

9. Victorian experience emphatically favours thorough vineyard tillage. Evidences concerning the most suitable depth is afforded by the northern Victorian irrigation settlements, where early and deep winter ploughing is now the recognized practice in the best worked vineyards, spring and summer working to a necessarily shallower depth receiving due attention.

DONALD CROP AND FALLOW COMPETITION.

Report by Judge, L. C. Bartels, B.Agr.Sc., Senior Irrigation Officer.

The outstanding feature of the crop competition in the Donald district observed during the judging tour was the number of good crops grown, despite the very dry season experienced.

It must be admitted that there was not the same correlation between the crops and the condition of the fallows which preceded the crops, but none of the exhibitors showed poor fallows. A dominant influence this year was the rain in October, which fell at a critical time, but it was not uniform through the district, so that some crops fared better than others. Even Swanwater West, which was considered to be well favoured, had received only 10½ inches to the end of November. Nearer Donald, at Mr. W. Hancock's, only 943 points had been registered, and at Carron, where Messrs. Pyers and Burton had shown such good fallows in 1926, only 750 points was received to the end of November.

Red ground crops had attained relatively better development than had those on black soil, but an attendant circumstance was that the crops on the red ground generally were sown earlier. This character of the red lands of the Wimmera in being more productive under adverse conditions recalls the fact that in the early days of settlement in the Wimmera the red ground was more highly appraised, and it is only by improved cultural methods that the black soils have been brought to the high pitch of productivity which they normally show. Red soils are usually ploughed in winter, and are stirred more deeply than the black, and are usually left with a knobby surface tilth.

In Mr. H. Hancock's crop on red ground there was a strip which was much superior to the rest. The strip had been summer-fallowed, i.e., it had been broken in late summer instead of in the winter. Generally it is not practicable to break the red fallows in autumn, but it would seem that an extended fallow period would increase their cropping capacity.

In some cases the crops which finished well had been eaten off during growth. Mr. Milbourne's crop, which was comparatively heavy at the end of November, had received drastic treatment in that regard. It was eaten off during the third week in August, and harrowed. Mr. Bould's crop also had been grazed.

Federation wheat is first favorite at Donald, and a number of excellent crops of that variety were seen. Its behaviour under the adverse conditions of the year must enhance its reputation. The farmers are not conservative, and several of the newer varieties have been tried.

All the crops inspected were practically free from disease. For bunt prevention, treatment of the seed with copper carbonate is now generally adopted.

The Winning Crops.

How the Land was Prepared.

Black Ground.

Mr. C. Coat's exhibit was a very attractive crop of Federation, uniform, level, and clean. A few wild oats and mustard plants showed. It was sown at the beginning of July, with 65 lb. of seed (treated with copper carbonate) and 80 lb. of superphosphate. The land bearing this

crop grew wheat in 1925. In March, 1926, it was scarified, skimmed at the end of April, harrowed at the end of July, again early in September, and once more at the end of November. It was harrowed twice in May, and again at the end of June, preparatory to sowing.

Mr. A. P. Bould presented for inspection a crop of Austan, which was dense in places, but somewhat irregular, due mainly to soil variations. Wild oats showed through the paddock. This crop was sown at the beginning of June, with 75 lb. of seed (dusted with copper carbonate) and 80 lb. of superphosphate. The land grew oats in 1925. In preparation for the wheat crop the paddock had been summer-fallowed. It was scarified in March, 1926, and harrowed in April and June; scarified and harrowed again at the end of June; harrowed in August, and scarified and harrowed once more in mid-September; cross-harrowed at the beginning of October; "rigid" cultivated at the end of October and harrowed. Sheep were on the fallow at intervals throughout. No further working was given the land till February, when it was harrowed after rain. It was harrowed and "combine" cultivated before sowing.

Red Ground.

Mr. Milbourne showed an excellent crop of Federation on red soil; it had finished well and bore good heads. The wheat was pure and the crop clean. There were some irregularities, due to variations in the ground, and in a few patches "take-all" appeared to be present. The land on which the crop was grown had been out of crop for six years. It was ploughed to a depth of 3½ inches in July, 1926; harrowed and spring-cultivated in August; harrowed in September, and spring-cultivated twice in the same month; and harrowed in November. Nothing further was done until the following mid-April, when the land was spring-tooth-cultivated, and harrowed soon after. It was spring-cultivated preparatory to sowing at the end of May, and was harrowed after sowing. It was eaten off by sheep towards the end of August, and harrowed again; 87 lb. of seed, which had been dusted with copper carbonate, and 94 lb. of superphosphate were used per acre.

Messrs. T. and J. Pope's crop of Federation, on red ground, was very well developed, but wild oats were scattered throughout. The land was skim-fallowed 3½ inches deep in July, 1926; scarified 2½ inches deep at the end of August; skimmed in early October, and harrowed in mid-November. In January the fallow was harrowed and spike-rolled; in May it was scarified, and at the end of May the crop was sown with 60 lb. of seed (copper carbonate treated) and 80 lb. of manure per acre.

The Best Fallow.

Black Ground.

In the Black Ground Fallow Competition at Donald the same competitors are prominent every year, and it is difficult to separate the best fallows. Their excellence undoubtedly reflects the manner of working rather than the quality of the land or any accidental features, because the same men produce equally good results on widely separated parts of their farms, or even on different farms.

Mr. R. Adams, whose fallow was placed first in this competition, has always shown a creditable exhibit, and this year his fallow was an attractive one, very clean, with a mulch of good texture and right depth.

The seed-bed was level and firm. In March the wheat stubble from the 1925 crop was burnt, and the land was skim-ploughed to a depth of 4 inches at the end of March. It was harrowed at the beginning of June; scarified deeply the third week in July, and harrowed. It was cross scarified at the beginning of September, and harrowed on three late occasions.

Mr. H. Hancock showed two exhibits adjoining, on land which had been in wheat in 1926. In March the land was disc-ploughed 4 inches deep; it was harrowed in April and again in June; skim-ploughed 3 inches deep in August; harrowed in September, and twice in October. Exhibit "A" received another harrowing in November. The result was a good fallow, with the mulch a little on the deep side, but the seed-bed was firm, level, and moist.

Red Ground.

Messrs. W. and J. Pope, Donald, each submitted half of 100 acres of fallow on red ground, and these entries were awarded first and second place. Mr. W. Pope's exhibit (on the south side) had a surface slightly less lumpy than Mr. J. Pope's entry, otherwise they were similar. They were clean, and the mulch generally was good. The seed-bed in each case was level, firm, and moist. The land had been skim-ploughed 3½ inches deep in June; scarified at the beginning of September; scarified with harrows attached at the beginning of October; harrowed in mid-October; and cultivated with harrows attached at the end of October.

Mr. H. Hancock's red-ground fallows were in good condition. They were ploughed 4 inches deep in July; harrowed in August; and spring-tooth cultivated at the end of September. Another cultivation was given in November to cut out "paddy melons."

List of Awards.

CROPS.

Competitor.	Apparent Yield.	Purity of Type.	Freedom from Disease.	Freedom from Weeds.	Evenness.	Total.
Possible points	**35**	**20**	**15**	**15**	**15**	**100**
Black Ground.						
Coats, C.	29	19	14	14	14	90
Bould, A. P.	30	19	14	13	13	89
Wells, D.	26	19	14	12½	14	85½
Bassett, L. L. (A)	24	19	14	14	14	85
Wells, L.	26	19	13	13	14	85
Bassett, W.	22	19	14	14	14	83
Bassett, C. W.	22	19	14	14½	13½	83
Bassett, L. L. (B)	21	19	14	14	14½	82½
Red Ground.						
Millbourne, J.	31	19½	14	14	13	91½
Pope, T. & J.	29	19	14	12	14	88
Hancock, H. O. (A) ..	27	19	14	13½	13	86½
Pope, W. G.	28	18	13	13	13	85
Pope, H. S.	25	19	14	14	13	85
Hancock, H. O. (B) ..	25	19	14	13	13	84
Pope, G. L.	22	18	12	14	13	79

FALLOWS.

Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation.	Total.
Maximum Points	**25**	**25**	**25**	**25**	**100**
Black Ground.					
Adams, R.	23½	25	24½	25	98
Hancock, H. (A)	24	24	24	24	96
Bassett, L. L. (B) ..	23½	24	24	24	95½
Wells, D.	23½	23½	24½	24	95½
Bassett, L. L. (A) ..	23	24	24	24	95
Bassett, C. W.	23	23½	25	23½	95
Hancock, H. (B)	23½	23½	24	23½	94½
Bassett, W.	22	24	24	24	94
Pope, W. G.	23	24	24	23	94
Hancock, W.	23	23½	24	23	93½
Pyers, A.	23¼	24	22	22½	92
Beckham, A. (A)	22½	22½	24	23	92
Pope, H. N.	22	22	24	22	90
Pyers, A. J., junr. ..	21	22½	24½	22	90
Beckham, A. (B)	22	22½	23½	22	90
Pope, H., junr.	23	22	21½	21	87½
Oakley Bros.	20	21	24	22	87
Pope, G. L.	22	20	24	20	86
Red Ground.					
Pope, W. (Donald) ..	23½	23	24	23	93½
Pope, J.	23	23	24	23	93
Hancock, H. (A)	23	23	24	23	93
Hancock, H. (B)	23½	22½	24	23	93
Hancock, W.	23	23	24	23	93
Reseigh, S. (A)	24	23	23	22½	92½
Pyers, A. J.	22½	23	24	22½	92
Pope, T. P.	22½	23	24	22½	92
Burton, M.	22½	22½	24	22½	91½
Milbourne, J.	22½	23	24	21½	91
Reseigh, S. (B)	23½	22	22	22½	90
Pope, G. L. (B)	24	21	24	21	90
Pope, H. N.	22½	21	24	21	88½
Pope, G. L. (A)	22	21	24	20	87

BIRCHIP CROP AND FALLOW COMPETITIONS, 1927.

Report of the Judge, L. C. Bartels, B.Agr.Sc., Dept. of Agriculture.

There were several crops in the Birchip district this year which would have done credit to the farmers in a normal year. The best crops were mostly on the sandy loam soils.

The seasonal conditions may be gauged from the rainfall. At Reedy Dam, for example, only 645 points was recorded by Mr. Gerlach to the end of November, and this was spread over 49 separate falls. At Cambrai Park, the residence of Mr. Reseigh, there was a similar total fall recorded on 60 different days, and no single fall reached 50 points.

The development of good crops despite the dry conditions was a direct result of good methods, although on some of the heavier soils the abnormally dry spring prevented the promise of the crops in the early stages from being realized.

It is strongly recommended that all competitors in future competitions should keep full details of cultural operations pertaining to the exhibits. By this means it will be possible to gauge the influence of different practices on the resultant crop yields. In this regard a most valuable lesson was missed in the case of one of the entries; the crop was a relatively good one throughout; still there were well-defined strips apparent by following the drill marks, which were better to the extent of 4 bushels to 6 bushels per acre. Obviously one of the factors, such as the treatment given to the seed before sowing, the rate of seeding, the rate of manuring, or depth of sowing, influenced the crop to that extent, but only vague information on these points was forthcoming. The farmer should work on definite lines, with a reason for every operation, and any variation from standard practice, either by accident or design, should be noted. The value of the competitions from an educational point of view will be considerably increased if an accurate record of operations is kept, and furthermore reliable rain records are valuable. The spring rain this year was patchy, and as a result some crops on good fallow failed to reach the condition of others on indifferent fallow.

Nearly every crop inspected was of a different variety, including Federation, Currawa, Nizam, Ranee, Rajah, Moira, Gallipoli, Austan, Joffre, &c. All of these are good wheats, and promising crops of all were seen. The appearance of the two standards, Federation and Currawa, in the two winning crops suggests their high quality and suitability, even under dry conditions.

Farmers of the district are apparently looking for a suitable wheat for general adoption. Mr. Gerlach, for example, had several plots of different varieties, but he favours the older types, and had included in his plots King's Early and Canberra. His contention was that in his experience most of the seasons were relatively dry at Birchip and favoured early-maturing wheats.

Farmers should not adopt a variety because of its behaviour in one year or in an isolated instance. It is suggested that they should watch the published results of the departmental trials—particularly the summarized yields for several years—for guidance in regard to varieties. Strange as it may seem, some farmers appraise the quality of a variety solely by the appearance of the grain.

It may be emphasized that the man who pays attention to cultural practices will secure good results with practically any midseasonal or early wheat which is in general use; in other words, attention to fallows and liberal manuring will increase yields when a change of variety might fail to do so.

Crops.

Mr. Matt. Green's crop of Federation was an attractive one, very free from weeds and disease. It had been regularly drilled, although variations in the soil made it a little uneven. The land bore a crop of oats in 1925. In May, 1926, it was ploughed 2½ inches deep and subsequently harrowed three times at intervals after rain. It was scarified at the end of July, scarified in October after rain, and in November harrowed. It received one harrowing after rain in late summer, and was

spring-tooth-cultivated before sowing. The land was never worked in a dry condition. It was sown with the combine with 79 lb. of seed treated with copper carbonate dust, and 110 lb. of super. per acre. After sowing the land was harrowed.

Mr. Smith's exhibit was a crop of Currawa which promised a good yield, but a rather profuse development of wild oats in parts detracted from its quality. It varied in strips through the crop, but generally was tall, upright and well-headed. The wheat was pure and free from disease. The paddock was in oats in 1925, and in May it was ploughed 2½ inches deep, spring-tooth-cultivated at the end of June and again at the beginning of August. It was then harrowed. In October it was spring-tooth-cultivated and was deeply scarified at the beginning of May, then spring-cultivated lightly. It was sown with the combine in May and harrowed. Seed 100 lb. and super. 105 lb. per acre were sown.

Fallows.

Mr. Everett's exhibit of fallow at Galaquil was a good one, although a few weeds were a blemish; otherwise it conformed to requirements. The mulch was of a depth of 2½ inches, and the seed bed was firm and fairly level. The area was in wheat in 1926. The land was scarified 2 inches deep in March, scarified in June to a depth of 3 inches, harrowed at the beginning of July, and scarified about 2 inches deep about the middle of July. It was harrowed at the beginning of August and the beginning of November.

Mr. J. King's (B) exhibit of fallow was a meritorious one. The land was scarified in March 2½ inches deep, again in July and at the end of August. In October it was harrowed.

Mr. Smith's was a winter fallow, ploughed to a depth of 3½ inches in July, harrowed in mid-September and cultivated after rain in October. This fallow had a high moisture content and was clean, but the mulch was rather deep and cloddy.

Mr. Balsarini's fallow was in generally good order. The mulch was good, although rather too lumpy in places. The seed-bed was firm. The fallow was scarified in March, in July spring-cultivated, again cultivated after rain in August, and harrowed after rain in October.

List of Awards.

Crop Section.

Competitor.	Apparent Yield.	Purity of Type.	Freedom from Disease.	Absence of Weeds.	Evenness.	Total.
Possible points	**35**	**20**	**15**	**15**	**15**	**100**
Green, P. M.	30	19	14	14	14	91
Smith, E. J.	29	19½	14½	10	14	87
King, S. (B)	22	19	14	13½	13½	82
Bolden, F. J.	20	19	14	14	14	81
King, J.	22	19	14	13	13	81
Reseigh, S. (A)	23	19	14	11	13	80
Kirsch, E.	18	19	14	15	13	79
King, S. (A)	12	19	14	14	14	73
Reseigh, S. (B)	12	18	15	13	12	70

FALLOW SECTION.

Competitor.	Moisture.	Mulch.	Absence of Weeds.	Cultivation.	Total.
Possible points	25	25	25	25	100
Everett, A. C.	23	24	23	23½	93½
King, J. (B)	23	23	24	23	93
Balsarini, C.	22	23	25	23	93
Hillgrove, J. C.	23	23	24	23	93
Smith, E. J.	24	22	24	23	93
Reseigh, S. (A)	21	23	25	23	92
King, J. (A)	22	22	24½	22	90½
King, S. (A)	23	22	23	22	90
Green, P. M.	23½	22	22	22	89½
Hoare & Gerlach	22½	22	24	21	89½
Kirsch, E. C.	22	23	21	23	89
Bolden, F. J.	22	22	23	22	89
Barber, S., & Sons ..	23	21	23	22	89
Reseigh, S.	21	22	24	21	88
King, S. (B)	23	20	22	20	85
King, S. (C)	22	21	22	20	85
Reed, W.	23	20	20	20	83

YARRAWONGA CROP AND FALLOW COMPETITION, 1927.

Report of the Judge, A. J. Vasey, B.Agr.Sc., Science Field Officer.

The crops in the Yarrawonga district were remarkably good considering the adverse season. The average yield of the exhibits in the competition would be about seven bags to the acre—a result achieved by the thorough preparation of fallows on a good sub-soil. Most crops suffered severely from the effects of the dry September, and the degree of recovery they were able to make when the weather broke in October was almost directly in proportion to the manner in which they had been sustained by the seed-bed. The variation in crops on similar country, and in many cases on fallows of similar quality, may be explained by the patchiness of the rainfall. To quote a specific instance, the first prize crop was grown in a locality where in a normal year excessive moisture prevents maximum production. It is proposed to make a general report on the competition, and then later make further observations on the winning crops.

Varieties.

In such a season as this, differences in the drought resistance of the several varieties are most marked, and a few observations in this regard may not be out of place. By far the great majority of the crops inspected were of Federation. This well-known variety is an excellent wheat on good fresh country, in a normal season. It appears to rely chiefly on the large number of heads produced per acre for its heavy yields. Hence it does best where conditions of soil and season are favorable for heavy stooling in the early spring, with good rains later, so that a majority of these early stools will mature heads. Federation generally looks a thick crop early in the growing period, and, if conditions are favorable, continues so, and yields well; but should unfavorable conditions—a dry September—occur, there may be a high death-rate of the stools. It is then that the amount of moisture which the heavy early growth has taken out of the ground may reduce the length of time a variety can withstand a dry spell, and change its manner of development.

This is probably what occurred this year. Early-growing conditions were favorable, and then came the dry September. As Mr. Vagg remarked, "The only district in which Federation is definitely holding its own is on the black soils of the Wimmera." There stooling conditions are of the best, and good later rains are to be fairly confidently expected. In some other districts varieties of the Federation type, but of greater drought resistance, are finding favour. Such a wheat is Nizam, which is already well and favorably known.

Another variety worthy of consideration for the main crop is Free Gallipoli, which produced the winning crop this year. This wheat is a cross on Yandilla King, to which in type the variety Graham closely approximates. Its drought resistance appears to be attributable to a more conservative stooling in early spring and the maturing of a high percentage of good heads on the fewer stools produced. Compared with Federation the crop looks thin in September, but finishes very well indeed. Several good crops of Graham were inspected.

Turvey is one of the most prolific of the Purple Straw types, and this is the reason it has been retained so long. Its drawback, in its liability to shake, limits the area on which it can be sown with safety. For a similar reason, Waratah cannot be regarded as a main crop variety, from 50 to 100 acres being sufficient: the same applies to Rajah: it is desirable that both these varieties should be sown late. Wandilla may be capable of better things in a good season, but this year it was not impressive, as in most cases it "tipped" badly.

Rate of Seeding and Application of Manure.

As regards rate of seeding, little is to be gained by increasing this above 75 lb. per acre for Federation, Nizam, or Free Gallipoli; Waratah and Rajah may be sown from 5 to 10 lb. heavier.

The average dressing of superphosphate of the crops exhibited was about 90 lb. per acre, and it would appear that the application of superphosphate on all district crops could with profit be increased to this amount—if not beyond it for land repeatedly cropped after fallow. For stubble crops or fresh country, a lower dressing of about 60 lb. per acre is more advisable.

Weeds.

As was only to be expected, with such a dry autumn and so little weed growth on the fallows, the early-sown crops contained a fair amount of wild oats and mustard. The second place crop lost several points for a serious infestation under this head.

Disease.

The most serious disease noticed was flag smut, which occurred almost generally in the competition crops. This is mainly a disease of ground infection, like "take-all," and may be controlled in the same way—that is, by burning stubbles and growing oats in rotation with wheat. Further, the wheat crop should be grown on clean, well-prepared fallow, worked, if at all possible, only when in a moist condition. In only one instance in the crops entered in the Yarrawonga competition this year had oats been grown in the rotation adopted, and in that case the crop was free from flag smut. In all other cases the fallow had either been ploughed from grass or from wheat stubble. This and the fact that many of the fallows had of necessity been worked dry in the spring of 1926 is probably the explanation of the prevalence of flag smut. The wheat-oats-fallow rotation is to be commended, oats following every second wheat crop at least. Both oats and hay have been readily saleable this year, but even if they could not be sold they could be held as reserve fodder for sheep. Further, the oat crop is quite effective as a preventative of the disease if it is grazed to sheep until September, and if the sheep be then removed, a good crop of grain will probably result.

Very little "take-all" or foot-rot of any description was noticed in the crops this year.

Loose smut was fairly prominent in all crops inspected, with one exception. The incidence of this disease is in no way associated with the increasing use of the dry powder pickles in this district. The preventive treatment is pickling in hot water. The apparatus required to do the job efficiently is rather elaborate and cannot be recommended for use by the individual farmer.

By far the great majority of the competitors had pickled their seed with dry powder. Several crops whose seed had been treated with bluestone were also seen. Only one entry was infected with ball smut or bunt, this having been sown early, dry, and unpickled. Careful pickling with one of the dry powder pickles would have prevented this loss.

Evenness.

Under this heading is considered the general evenness of the crop as reflecting uniform and careful working of the fallow; also the care taken in putting the crop in, as shown by the drilling; or, in other words, the job as a whole.

The Yarrawonga crops were fairly even in appearance, but the drilling generally was indifferent. In many cases it was possible to count the drill widths by the "misses" in overlapping. Such "misses" grow only weeds, and, in consequence, are liable to harbour diseases, and may eventually become the centre for the development of "take-all" patches. A good deal of criticism in this connexion has been levelled at the "combine," in that once off the line it cannot quickly be brought back on to it.

Observations on Crops.

Mr. R. Hammon's winning crop was sown early in May with Free Gallipoli at the rate of 75 lb. of dry-pickled seed per acre and 90 lb. of superphosphate. It was a very fine crop indeed of good purity, but contained the only too common diseases of flag smut and loose smut. The weed infection consisted of a few wild oats. It was the only crop to receive full marks for evenness, the drilling being the finest seen in the competition.

Mr. W. Lewis, junior, obtained second place with a very fine crop of Turvey, the fallow having carried the crop on magnificently during the dry spell. Sown at the end of May, it received 80 lb. of dry-pickled seed, and 80 lb. of superphosphate per acre. Although the purity was on the whole good, a fair sprinkling of Federation heads was noticed, due, according to Mr. Lewis, to driving the combine full of this variety of seed across the area to reach another portion of the paddock. Loose smut and flag smut were noticed, and the drilling was not very good. An unfortunate weed infestation seriously detracted from an otherwise excellent exhibit.

Messrs. J. A. Sloane and McWalters showed a nice crop of Nizam, which gained third place. Sown at the end of May, 75 lb. of seed—dry-pickled—and 100 lb. of superphosphate were applied. As can be seen from the marking, the purity was excellent, and in freedom from disease high marks were also gained. Flag smut was practically absent, and only an isolated plant affected by loose smut was found. Incidentally this was the only crop whose fallow had been preceded by an oat crop. The oats, it is understood, were grazed till September, and then, coming again, were stripped. This practice cannot be too highly commended to the farmers of the Yarrawonga district. The drilling might have been better, and, chiefly in the "misses," weed growth was apparent. As can be seen by reference to the fallow marks, this exhibit was not placed particularly high. All the clods, however, were on the surface, and conditions as to seed-bed were satisfactory. During September the crop was rolled, and this treatment greatly benefited it. A mulch was thus formed round the young plants, and the surface was reduced to a fine condition, which enabled the greatest advantage to be taken of all the light showers which fell. The same applies to the more finely worked fallows this year: a particular case is that of Mr. E. Bott's No. 2 entry. More finely worked with the harrows than is generally desirable, it came through the dry season remarkably well. In a normal to wet year, such a practice would be unnecessary and dangerous on account of the setting of the finely-worked surface.

Messrs. Forge Bros.' crop on their No. 1 fallow was an instance of the characteristic behaviour of Federation in a dry season on fresh country. What must have been a wonderfully fine crop in the early spring faded away considerably when the dry conditions set in. Under similar conditions as to ground, though on a much rougher fallow, Mr. R. Williams grew a very fine crop of Graham.

The two entries of Messrs. Johnston and Short and Messrs. Johnston and Umbers also call for comment. The latter, a very rough one, grew the better crop. Very similar ground and conditions generally prevailed in both, but the crop of Messrs. Johnston and Umbers received a 20-lb. heavier dressing of superphosphate.

It will be noticed that several entries were withdrawn from the crop competition. The withdrawals were chiefly the extra entries—second and third of the same competitor—and were cancelled out of consideration for the judge, and to save time in the judging of the competition.

In conclusion, I have once again to thank Mr. Vagg, the president of the society, and Mr Walker, the secretary, for their many kindnesses; and to congratulate the competitors on their sustained interest and enthusiasm.

List of Awards.

CROP COMPETITION.

Competitor.	Variety.	Yield.	Purity.	Absence of—		Evenness.	Total.
				Weeds.	Disease.		
Possible points	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
R. Hammon (1) ..	Free Gallipoli ..	35	19	14	13	15	96
W. Lewis, Jr. (1) ..	Turvey	35	19	12	14	13	93
Sloane and McWalters (1) ..	Nizam	31	19½	13	14½	14	92
W. Lewis, Sr. (2)	Turvey	30	19	14	13	13	89
R. Williams (3) ..	Graham	30	19	14	12	13	89
J. A. McPherson (1)	Graham	29	18	14	14	14	89
Gilmour Bros. ..	Free Gallipoli ..	27	19	14	13	14	87
P. Connell (1) ..	Nizam	26	19	14	14	14	87
J. Stevenson (1) ..	Federation ..	27	18	14	13	14	86
A. Browning (3) ..	Federation ..	25	19	14	14	14	86
E. Bott (2) ..	Nizam	28	17	14	13	13	85
W. Lewis, Jr. (2) ..	Waratah	27	19	12	13	13	84
W. Lewis, Sr. (1) ..	Federation ..	25	19	14	13	13	84
E. Bott (1) ..	Nizam & Wandilla	25	17	14	13	14	83
M. Toms (2) ..	Nizam	24	19	14	13	13	83
Sloane & McWalters (2) ..	Federation ..	22	19	13	14	14	82
Johnston & Umbers	Nizam	25	18	14	12	13	82
W. Dennis ..	Nizam & Federation	24	19	14	13	12	82
R. Williams (1) ..	Major	24	18	14	13	13	82
J. Thom (2) ..	Federation & Rajah	22	18	14	13	14	81
A. Browning (1) ..	Federation ..	21	19	14	12	14	80
A. Carmichael (1) ..	Graham	24	18	13	13	12	80
Forge Bros. (2) ..	Federation ..	22	18	13	13	13	79
J. Thom (1) ..	Federation ..	20	19	13	13	14	79
R. Williams (2) ..	Major	23	17	13	13	13	79
Johnston & Short ..	Nizam	22	16	14	12	14	78
L. Dwyer (1) ..	Federation ..	19	19	14	13	13	78
G. Bruce (2) ..	Federation ..	22	18	12	12	13	77
P. Connell (2) ..	Nizam	20	19	12	12	13	77
Forge Bros. (1) ..	Federation ..	18	18	14	12	13	75
P. Bruce (1 and 2)	Federation ..	19	18	12	13	13	75
G. Dennis ..	Federation ..	18	18	12	13	13	74
Thom Bros. (1 and 2)	Federation ..	16	18	13	13	13	73
G. Bruce (1) ..	Fed'n & Bald Early	18	17	12	13	13	73
A. Browning (2) ..	Federation ..	19	19	12	9	12	71
Johnston & West ..	Federation ..	16	18	13	12	12	71

Crops and Fallows.

Competitor.	Fallow.	Crop.	Total.
Possible points	**100**	**100**	**200**
R. Hammon (1)	91	96	187
W. Lewis, Jr. (1)	93	93	186
Sloane & McWalters (1)	87	92	179
J. A. McPherson (2)	87	89	176
W. Lewis, Jr. (2)	90	84	174
W. Lewis, Sr. (2)	85	89	174
W. Lewis, Sr. (1)	89	84	173
W. Dennis	90	82	172
M. Toms (2)	89	83	172
E. Bott (2)	88	83	171
J. Stevenson (1)	84	87	171
A. Carmichael	90	80	170
R. Williams (3)	81	89	170
E. Bott (1)	86	83	169
P. Connell (1)	82	87	169
Johnston & Short	89	78	167
J. Thom (1)	88	79	167
A. Browning (1)	87	80	167
R. Williams (1)	86	81	167
Sloane & McWalters (2)	85	82	167
A. Browning (3)	81	86	167
Forge Bros. (1)	91	75	166
Forge Bros. (2)	87	79	166
L. Dwyer (1)	87	78	165
Gilmour Bros.	78	87	165
P. Connell (2)	87	77	164
Peter Bruce	88	75	163
J. Thom (2)	82	81	163
Peter Bruce (2)	87	75	162
Thom Bros. (1)	88	73	161
R. Williams (2)	82	79	161
G. A. Bruce (2)	83	77	160
G. A. Bruce (1)	86	73	159
Thom Bros. (2)	86	73	159
Johnston & West	87	71	158
Johnston & Umbers	76	82	158
A. Browning (2)	84	71	155
G. Dennis	78	74	152

The awards are as follow for both the Crop and the Combined Crop and Fallow Competition:—

First .. .. R. Hammon, No. 1 Entry.
Second .. .. W. Lewis, Jr., No. 1 Entry.
Third .. .. J. A. Sloane & McWalters, No. 1 Entry.

APPLE AND PLUM PRESERVATION.

(By Miss A. Knight, Fruit Preserving Expert.)

The Apple.

The apple is regarded by many as the king of fruits. Most of us are fully aware of its wonderful medicinal qualities, and, with few exceptions, every one finds it an agreeable and wholesome food.

It may be said that the apple family caters for all tastes, as it includes sweet, sour, crisp, firm, and floury varieties, and from these we may choose good desert and good cooking varieties.

Hardly any fruit would be missed more than the apple. It will blend well with nearly all foods, and almost any flavouring agent will tone nicely with it.

If every housewife could make up her mind to preserve a case or more of good, juicy cooking apples, she would find them very useful during the spring and early summer when fruit is in many places unobtainable.

Any good cooking apple will preserve well. I would suggest that a quantity be preserved in the form of pulp or puree, for such makes a good foundation for many preparations suitable for the daily menu.

If we think for a moment of the many ways in which cooked apples may be served at table we will realize the value of having such a foundation at hand, and always ready to use. Some of the pulp should be put up plain, that is, sweetened to taste, but with the addition of no other ingredient than sugar. It is advisable, too, that some should be flavoured with various suitable flavourings. Some may be flavoured with whole ginger, some with cinnamon and cloves, and some with sweet spice. Apples can especially be recommended for variations of this nature, and we all know that a fresh method of serving food will often have a beneficial effect on the appetite.

Some Apple Dishes.

The gingered puree is excellent for tart fillings; so also is that flavoured with cinnamon and cloves. Plain sweetened apple pulp will blend well with fresh or preserved wild blackberries, while it will also work in to advantage with other tart fillings.

The proportion of apple puree for adding to the fresh blackberries would be one cup to two cups of blackberries; to these one tablespoon of sugar (or to taste), and a little strained lemon juice should be added. Either variety of paste may be used, flaky or short, according to preference.

The plain, sweetened, apple pulp makes an excellent sauce for serving with roast pork, duck, &c. For this purpose the contents of the jar should be re-heated in an enamelled saucepan. Then, after it has boiled for a minute or two, add the strained juice of half a lemon for each cup of apple pulp. Do not *boil* the sauce after adding the lemon juice.

The flavoured apple is nice when baked in a deep dish with the surface of the pulp covered with thin slices of buttered bread, then dusted with sugar and a little nutmeg. Sometimes, if the puree is very firm, the buttered bread will need to be slightly sprinkled with a little syrup, just to moisten it slightly. When nicely baked, serve hot with a little cream.

Dutch apple cake from preserved apple can be highly recommended; also many other similar tasty variations which can be quickly prepared.

Apple Puree—"Plain."

Take any good, tart, cooking apples. Peel, core, and cut them up. Put on to cook in the preserving pan, with very little water—just enough to prevent burning. Put the lid on the pan, and bring slowly to boiling heat, then remove the lid, and allow the fruit to boil for about fifteen minutes, stirring occasionally.

Meanwhile, the containers should be made quite hot. This is best done by steaming, or immersing them in hot water. When the jars are hot, ladle the boiling pulp carefully into them, and seal air-tight at once. Stand the jars on a wet cloth,and when cold they are ready for storing.

Gingered Apple Puree.

Proceed in the same manner as for the plain, but allow about ¼-lb. of sugar to each pound of apples, and a small piece of whole ginger. Dried ginger (also green, when procurable) is suitable, and should be bruised, tied in a piece of cloth, and suspended in the mixture during the cooking, and removed before the puree is bottled.

Cinnamon Flavoured Product.

Cook the apples and sugar in the same manner as that described for the gingered puree, but instead of ginger, add about one inch of the stick cinnamon and three cloves to each pound of apples. When the product is cooked, remove the cinnamon and cloves from the puree, which should be bottled while at boiling heat.

Apple Marmalade.

For apple jam, or as it is sometimes called, apple marmalade, the Rokewood apple will give excellent results. The colour will be a deep red, and the flavour good if the apples are nice and fresh. A slow cooking is better than rapid boiling for apple jam.

Apple Blends.

Apple and quince in equal parts make up nicely, for either jelly or jam. Apple and rhubarb is another nice combination; also apple and mulberries.

Preservation of Plums.

Though plums will not, perhaps, blend in quite so many combinations in cooking as apples, they are an excellent fruit for winter use. They make good pies, and are very suitable for steamed suet puddings, and in the warmer weather they make nice chilled sweets. The plum season is not a long one, therefore it is well to have this fruit stored in the larder for winter use. The Orlean, Blue Diamond, Grand Duke, President, Yellow Gage, Green Gage, and Yellow Magnum Bonum are all good pie plums.

All plums for bottling are better for being on the firm side. The filling syrup should not be made too strong, as a very strong syrup will sometimes cause the skins to toughen. Extra sugar can always be added to them at the time of making the pie or pudding. The usual allowance of sugar when bottling the plums is 4 oz. to each pint of water. This is boiled for 10 minutes, then strained, and it is ready for use.

The raw plums should be packed into the preserving jars, with about a tablespoon of cold syrup, the jars then placed on the rack inside the sterilizer, with sufficient water to barely reach the top of the rack, and this is brought gradually to boiling heat. This heat is maintained for 10 to 15 minutes, according to size of jar. The jars are then filled with the boiling syrup from the kettle, and sealed air-tight at once.

Spiced plums suitable for serving with hot meats are appreciated by many. For spicing, firm-fleshed plums are the best to use. They should be heated through slowly by steam (but not softened too much), and the sweet spiced dressing poured over them while they are still hot. The dressing could be of any desired flavouring. The average fancy is something like this:—2 pints of vinegar; 1 ounce of cloves; ½ ounce of nutmeg; 1 ounce of cinnamon; 1 lb. or 1¾ lb. of sugar.

To make it, simmer the vinegar for a few minutes with the ingredients added. The latter, with the exception of the sugar, should be tied in a muslin bag and suspended in the vinegar. When sufficiently flavoured, remove the bag of spices. The vinegar is then ready to be poured over the plums. They should then be sealed and stored.

POULTRY FEEDING EXPERIMENT.

DRIED MILK v. MEAT MEAL.

A Two Years' Trial (1925-1927).

By W. O. Pederick, Assistant Poultry Expert, and A. G. Clark, Poultry Foreman, State Research Farm.

In a dry-mash trial a couple of years since with White Leghorns, the pen of birds in whose feed dried milk was included gave so very much better results than the pen to which meat meal was fed, that an experiment was arranged so as to put these two foods to a more conclusive trial. It was decided that the test should extend over two laying seasons so as to ascertain if the results of the first year would be maintained in the second year, and also to enable a note to be made if one food could be regarded as superior to the other in its effect on the birds during the moulting season.

For the experiment two pens of Black Orpingtons and two pens of White Leghorns were selected. Both pens of Black Orpingtons were fed on the free choice system, and the only difference in the feed given them was that one pen was allowed dried milk, while in place of dried milk the other pen was fed meat meal. The several varieties of food were placed in different hoppers, and were available to the birds at all times. The hoppers are vermin- and sparrow-proof. Each variety of food was weighed and the actual consumption by the birds in each pen was recorded every month. The White Leghorns were fed wet mash, the only difference in their feeding being that one pen was given dried milk as portion of its feed, while the other was given meat meal instead of dried milk.

On page 100 is printed a table (I.) giving the quantities of the various foods consumed month by month during the full period of the test by the pen of Black Orpingtons in whose feed dried milk was included; in this table also is shown the number of eggs laid each month and their value. On the opposite page in Table II. similar information is given regarding the pen in whose feed meat meal was included instead of dried milk. In Table III. is given a list of the foods consumed month by month during the test by the White Leghorns fed wet mash in which dried milk was included; and in Table IV. is set out the feed given to the pen fed wet mash with meat meal instead of dried milk.

Table I.—Dried Milk Test 1925-27, with Black Orpingtons.

(60 Birds.)

Fed under Free Choice System.

Date.	Bran.	Pollard.	Dried Milk.	Wheat.	Oats.	Maize.	Barley.	Eggs.	Price per Dozen.	Value.
									s. d.	£ *s. d.*
1925-26 Season.										
1925.										
May ..	9	7½	31½	185	110½	65	35	590	2 6½	6 4 11
June ..	1	8½	30	128	76½	53	51	825	2 3	7 14 8
July ..	14	9	40	115	70½	79	64	841	1 7	5 10 11
August ..	11	15	36	143	42	76	46	1,000	1 4½	5 14 7
Sept. ..	16	22	43	161	65	62	52	1,143	1 2½	5 15 1
Oct. ..	19	19	38	96	86	77	65	1,190	1 1½	5 11 7
Nov. ..	6	35	22½	158	51	62	20	964	1 2	4 13 9
Dec. ..	24	21	38½	76	37	49	77	812	1 4	4 10 3
1926.										
Jan. ..	25	29	37	170	56	50	60	907	1 3½	4 17 7
Feb. ..	22	16	36	109	76	67	65	814	1 7	5 7 5
March ..	19	11	36	85	89	84	51	908	1 9	6 12 5
Totals	166	193	388½	1,426	759½	724	586	9,994	..	62 13 2
1926-27 Season.										
April ..	15	24	15	126	59	61	43	526	2 5	5 5 11
May ..	21	28	10	110	68	100	38	441	2 7	4 14 11
June ..	23	30	7	194	71	29	39	407	2 5	4 2 0
July ..	16	20	9	159	100	91	25	458	1 7	3 0 5
August ..	16	23	15	151	93	58	36	674	1 7	4 8 11
Sept. ..	29	24	33	110	107	18	52	875	1 2	4 5 1
Oct. ..	25	21	34	138	46	52	24	915	1 2	4 9 0
Nov. ..	21	8	39	95	56	65	49	754	1 3	3 18 6
Dec. ..	10	9	29	165	101	16	33	684	1 6	4 5 6
1927.										
Jan. ..	12	8	35	161	43	46	34	661	1 6	4 2 7
Feb. ..	13	8	40	102	68	50	22	553	1 11	4 8 4
Totals	201	203	266	1,51	812	586	395	6,948	..	47 1 2

Table II.—Meat Meal Test 1925-27, with Black Orpingtons.

(60 Birds.)

Fed under Free Choice System.

Date.	Bran.	Pollard.	Meat Meal.	Wheat.	Oats.	Maize.	Barley.	Eggs.	Price per Dozen.	Value.
									s. d.	£ *s. d.*
1925–26 Season.										
1925.										
May ..	32	10½	3	119	126	53	76	466	2 6½	4 18 8
June ..	21	17½	1½	79	100	74	107	762	2 3	7 2 10
July ..	28	13	3½	101	74	68	76	624	1 7	4 2 4
August ..	21	15	3	132	73	94	51	681	1 4½	3 18 0
Sept. ..	33	30	1	100	64	61	42	946	1 2½	4 15 3
Oct. ..	14	49	2½	91	98	72	39	943	1 1½	4 8 5
Nov. ..	30	39½	1½	115½	54	70½	31	809	1 2	3 18 8
Dec. ..	8	32½	2	87½	63	46½	42	685	1 4	3 16 1
1926.										
Jan. ..	59	33	1	110	57	61	71½	688	1 3½	3 14 1
Feb. ..	18	48	1	105	72	50	31½	661	1 7	4 7 2
March ..	39	36	3½	81	61	68	78	658	1 9	4 15 11
Totals	303	324	23½	1,121	842	718	645	7,923	..	49 17 5
1926–27 Season.										
April ..	23	20	6	103	60	75	39	464	2 5	4 13 5
May ..	28	15	4	86	58	98	52	446	2 7	4 16 0
June ..	26	32	2	156	93	28	31	334	2 5	3 7 3
July ..	19	33	..	143	69	120	36	321	1 7	2 2 4
August ..	21	22	1	130	80	111	37	805	1 7	5 6 2
Sept. ..	21	21	..	100	126	62	40	1,048	1 2	5 1 11
Oct. ..	22	22	..	68	46	84	58	1,181	1 2	5 14 10
Nov. ..	16	19	..	87	52	52	70	1,074	1 3	5 11 10
Dec. ..	21	24	..	115	93	28	52	990	1 6	6 3 9
1927.										
Jan. ..	18	25	..	117	67	63	32	999	1 6	6 4 10
Feb. ..	16½	26	..	67	99	63	36	697	1 11	5 11 4
Totals	231	259	13	1,172	843	784	483	8,359	..	54 13 8

Table III.—Dried Milk Test 1925-27, with White Leghorns.

(60 Birds.)

Fed under Wet Mash System.

Date.	Bran.	Pollard.	Dried Milk.	Wheat.	Oats.	Maize.	Barley.	Eggs.	Price per Dozen.	Value.
									s. d.	£ *s. d.*
1925-26 Season.										
1925.										
May ..	30½	61	24	146	73	73	36½	712	2 6½	7 10 10
June ..	30½	61	22	131	65½	65½	32	765	2 3	7 3 5
July ..	36	72	23	141	70½	70½	36	778	1 7	5 2 8
Aug. ..	33½	67	17	140	70	70	35	714	1 4½	4 1 10
Sept. ..	39½	79	22	150	75	75	37½	1,294	1 2⅔	6 10 4
Oct. ..	41	82	25	143	71	71	36	1,384	1 1½	6 9 9
Nov. ..	38	76	22	124	62	62	31	1,127	1 2	5 9 7
Dec. ..	39	78	20	124	62	62	31	964	1 4	5 7 1
1926.										
Jan. ..	39	78	22	137½	68½	68½	34½	950	1 3½	5 2 3
Feb. ..	36	72	20	114	57	57	28	973	1 7	6 8 4
March ..	40½	81	22	124	62	62	31	611	1 9	4 9 1
Totals	403½	807	239	1,474½	736½	736½	368½	10,272	..	63 15 2
1926-27 Season.										
April ..	39	78	22	120½	60½	60½	30½	558	2 5	5 12 4
May ..	39	78	21	128	64	64	32	372	2 7	4 0 1
June ..	39	78	22	120½	60½	60½	30½	296	2 5	2 19 7
July ..	40½	81	23	124	62	62	31	406	1 7	2 13 7
August ..	39	78	22	128	64	64	32	744	1 7	4 18 2
Sept. ..	39	78	22	121	61	61	31	844	1 2	4 2 1
Oct. ..	39	78	25	128	64	64	32	897	1 2	4 7 2
Nov. ..	39	78	22	204	..	..	68	682	1 3	3 11 1
Dec. ..	40½	81	23	210	..	..	70	619	1 6	3 17 4
1927.										
Jan. ..	39	78	21	216	..	..	72	548	1 6	3 8 6
Feb. ..	36	72	20	192	..	..	64	500	1 11	3 19 10
Totals	429	858	243	1,692	436	436	493	6,466	..	43 9 9

Table IV.—Meat Meal Test 1925-27, with White Leghorns.

(60 Birds.)

FED UNDER WET MASH SYSTEM.

Date.	Bran.	Pollard.	Meat Meal.	Wheat.	Oats.	Maize.	Barley.	Eggs.	Price per Dozen.	Value.
									s. d.	£ *s. d.*
1925–26 SEASON.										
1925.										
May ..	30½	61	24	146	73	73	36½	537	2 6½	5 13 9
June ..	30½	61	22	136½	68	68	34	676	2 3	6 6 9
July ..	36	72	23	151	75½	75½	38	724	1 7	4 15 6
August ..	33½	67	17	140	70	70	35	811	1 4½	4 12 11
Sept. ..	39½	79	22	150	75	75	37½	1,240	1 2½	6 4 10
Oct. ..	41	82	25	143	71	71	36	1,249	1 1½	5 17 1
Nov. ..	38	76	22	124	62	62	31	1,027	1 2	4 19 10
Dec. ..	39	78	20	124	62	62	31	917	1 4	5 1 11
1926.										
Jan. ..	39	78	22	137½	68	68	34	961	1 3½	5 3 5
Feb. ..	36	72	20	114	57	57	28	863	1 7	5 13 10
March ..	40½	81	22	124	62	62	31	385	1 9	2 16 2
Totals	403½	807	239	1,490	743½	743½	372	9,390	..	57 6 0
1926–27 SEASON.										
April ..	39	78	22	120½	60½	60½	30½	443	2 5	4 9 2
May ..	39	78	21	128	64	64	32	308	2 7	3 6 4
June ..	39	78	22	120½	60½	60½	30½	218	2 5	2 3 11
July ..	40½	81	23	124	62	62	31	239	1 7	1 11 6
August ..	39	78	22	128	64	64	32	702	1 7	4 12 7
Sept. ..	39	78	22	121	61	61	31	1,067	1 2	5 3 9
Oct. ..	39	78	25	128	64	64	32	1,198	1 2	5 16 6
Nov. ..	39	78	22	204	...	..	68	1,107	1 3	5 15 4
Dec. ..	40½	81	23	210	..	..	70	899	1 6	5 12 4
1927.										
Jan. ..	39	78	21	216	..	..	72	920	1 6	5 15 0
Feb. ..	36	72	20	192	..	..	64	611	1 11	4 17 7
Totals	429	858	243	1,692	436	436	493	7,712	..	49 4 0

Table V.—Quantity of Food Consumed and its Cost.

Dried Milk v. Meat Meal Test.

Food.	Price.	No. 1. Black Orpingtons, Free Choice—Dried Milk.		No. 2. Black Orpingtons, Free Choice—Meat Meal.		No. 3. White Leghorns, Wet Mash—Dried Milk.		No. 4. White Leghorns, Wet Mash—Meat Meal.	
		Quantity.	Cost.	Quantity.	Cost.	Quantity.	Cost.	Quantity.	Cost.
		lb.	£ s. d.	lb.	£ s. d.	lb.	£ s. d.	lb.	£ s. d.
(1) From 1st May, 1925, to 31st March, 1926 (11 months).									
Bran ..	£8 per ton ..	166 ..	0 13 3	303 ..	1 4 3	403½ ..	1 12 3	403½ ..	1 12 3
Pollard ..	£9 per ton ..	193 ..	0 17 4	324 ..	1 9 2	807 ..	3 12 7	807 ..	3 12 7
Meat ..	2d. per lb.								
Milk ..	5d. per lb.	388½ (milk)	8 1 10	23½ (meat)	0 3 11	239 (milk)	4 19 7	239 (meat)	1 19 10
Wheat ..	6s. 3d. per bush.	1,426 ..	7 8 6	1,121 ..	5 16 9	1,474½ ..	7 13 7	1,490 ..	7 15 2
Oats ..	2s. 5d. and 2s. 7d. per bush.	759½ ..	2 17 4	842 ..	3 2 8	736½ ..	2 15 8	743½ ..	2 16 1
Maize ..	5s. 3d. per bush.	724 ..	3 7 10	718 ..	3 7 4	736½ ..	3 9 0	743½ ..	3 9 9
Barley ..	3s. 11d. per bush.	586 ..	2 5 11	645 ..	2 10 6	368½ ..	1 8 10	372 ..	1 9 2
	Total ..	4,243 ..	25 12 0	3,976½ ..	17 14 7	4,765½ ..	25 11 6	4,798½ ..	22 14 10
(2) From 1st April, 1926, to 28th February, 1927.									
Bran ..	£7 5s. per ton ..	201 ..	0 14 7	231 ..	0 16 9	429 ..	1 11 1	429 ..	1 11 1
Pollard ..	£9 1s. per ton ..	203 ..	0 18 5	259 ..	1 3 5	858 ..	3 17 8	858 ..	3 17 8
Meat ..	2d. per lb.								
Milk ..	5d. per lb.	266 (milk)	5 10 10	13 (meat)	0 2 2	243 (milk)	5 1 3	243 (meat)	2 0 6
Wheat ..	6s. 3d. per bush.	1,511 ..	7 15 4	1,172 ..	6 2 1	1,692 ..	8 16 3	1,692 ..	8 16 3
Oats ..	3s. 1d. per bush.	812 ..	3 2 7	843 ..	3 5 0	436 ..	1 13 7	436 ..	1 13 7
Maize ..	6s. 6d. per bush.	586 ..	3 8 0	784 ..	4 11 0	436 ..	2 10 7	436 ..	2 10 7
Barley ..	3s. 9d. per bush.	395 ..	1 9 7	483 ..	1 16 3	493 ..	1 17 0	493 ..	1 17 0
	Total ..	3,974 ..	22 19 4	3,785 ..	17 16 8	4,587 ..	25 7 5	4,587 ..	22 6 8
Total for 22 months ..		8,217 ..	48 11 4	7,761½ ..	35 11 3	9,352½ ..	50 18 11	9,385½ ..	45 1 6

Table VI.—Summary of Results.

Pen.	Average No. of Eggs Laid per Bird.	Return per Bird.	Average of Food Consumed per Bird.	Food Cost.	Profit over Cost of Food.
		£ s. d.	lb.	£ s. d.	£ s. d.
No. 1. DRIED MILK TEST.					
Black Orpingtons, Free Choice—					
First season (11 months) ..	166·56	1 0 10½	70·71	0 8 6¼	0 12 4¼
Second season (11 months) ..	115·8	0 15 8¼	66·23	0 7 7¾	0 8 0½
Total	282·36	1 16 6¾	136·94	0 16 2	1 0 4¾
No. 2. MEAT MEAL TEST.					
Black Orpingtons, Free Choice—					
First season (11 months) ..	132	0 16 7½	66·27	0 5 10¾	0 10 8¾
Second season (11 months) ..	139·3	0 18 2¾	63·08	0 5 11½	0 12 3¼
Total	271·3	1 14 10¼	129·35	0 11 10¼	1 3 0
No. 3. DRIED MILK TEST.					
White Leghorns, Wet Mash—					
First season (11 months) ..	171·2	1 1 3	79·42	0 8 6¼	0 12 8¾
Second season (11 months) ..	107·76	0 14 5¾	76·45	0 8 5½	0 6 0¼
Total	278·96	1 15 8¾	155·87	0 16 11¾	0 18 9
No. 4. MEAT MEAL TEST.					
White Leghorns, Wet Mash—					
First season (11 months) ..	156·5	0 19 1¼	79·97	0 7 7	0 11 6¼
Second season (11 months) ..	128·53	0 16 4¾	76·45	0 7 5¼	0 8 11½
Total	285·03	1 15 6	156·42	0 15 0¼	1 0 5¾

Table VII.—Live Weight Records during Period of Experiments.

(The weights given are the average for each pen on date of weighing.)

Date.	Pen No. 1.	Pen No. 2.	Pen No. 3.	Pen No. 4.
	Dried Milk, Black Orpington, Free Choice.	Meat Meal, Black Orpington, Free Choice.	Dried Milk, White Leghorn, Wet Mash.	Meat Meal, White Leghorn, Wet Mash.
1925.	lb.	lb.	lb.	lb.
1st May	3·83	3·91	3·11	3·13
30th October ..	4·58	4·43	3·5	3·53
1926.				
14th May	4·69	4·46	3·81	3·79
— August ..	5·38	5·18	4·31	4·41
— December ..	5·25	4·79	3·64	3·77
1927.				
28th February ..	5·06	4.69	3·69	3.81

Comments on Experiment.

Although the pens to which meat meal was fed showed a greater net profit than those to which dried milk was fed, it was very noticeable that the birds which were given milk laid much better than the others during the autumn and winter, and they certainly came through the moult very much easier.

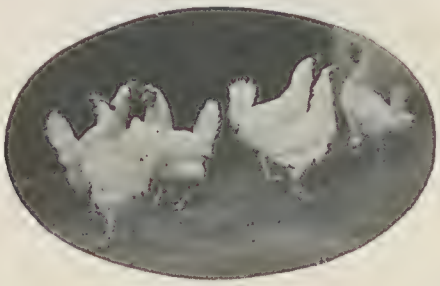
The test showed that it would probably pay to feed dried milk to layers from about February to August, but during the spring and summer months milk has little or no advantage over meat meal, a feed that is much cheaper.

The test also demonstrated that with reasonably good layers it pays handsomely to keep them for egg-production for two seasons. In the case of No. 2 Pen, the birds laid a greater number of eggs in the second season than in the first. Even if no greater number of eggs be laid, it would still be better to keep most birds for a second season. It must be remembered that a pullet does not start to lay until she is about six months old, and the cost of food for that period has to be deducted from the first season's profit. Further costs are those of incubating and brooding.

IMPORTATION OF EGGS TO ENGLAND.

According to official reports, British imports of eggs show no abatement. In the first nine months of 1927 there was an increase in the number imported, compared with 1926, of nearly 14,000,000 dozen, the total imports rising to 181,414,530 dozen.

The Irish Free State has now superseded Denmark as the largest supplier for the British market. Poland is rapidly advancing as a source of supply, no fewer than 30,117,290 dozen being sent to Great Britain in the first nine months of 1927, as against 7,881,900 dozen two years previously.



POULTRY-KEEPING ON DAIRY FARMS.

By W. C. Rugg, Chief Poultry Expert.

The production of eggs is essentially a farm enterprise, and may be most profitably conducted as part of the general dairy-farming operations.

A flock of 200, or perhaps more, can be kept without interfering with other work, and with very little additional labour and expense. The essentials for success are:—

1. Pure-bred stock of good laying strain.
2. Good housing.
3. Good feeding.
4. Intelligent marketing.

There is no "best" breed suitable for all purposes, but it is an accepted fact that pure-breds pay better than cross-breds. The advantages of pure-breds are: Higher production of eggs and more uniformity when sold for table purposes. A further advantage, though not a financial one, is that a flock of pure-bred birds of uniform size and colour presents a much better appearance on the farm than one of all sorts and conditions.

In most cases when farmers complain that the keeping of poultry is unprofitable, it is due to the fact that the birds are not pure-bred, or, if pure, are not bred from a high-producing strain.

A number of farmers now realize that high egg production can be bred into fowls just as surely as high butter-fat production is bred into dairy heifers. Unfortunately, the majority of farmers look upon poultry as too insignificant for their attention, yet no other farm operation will pay as well as poultry-keeping, bearing in mind the amount of capital invested.

From numbers of reputable poultry-breeders good stock can be purchased at reasonable rates; but, unfortunately, as in most other businesses, there is a percentage of breeders who distribute poor quality stock. There are, however, several sources from which a dairy-farmer can obtain information as to the reliability of suppliers of stock, eggs, or chickens.

Is Poultry-rearing Profitable?

To show what profit can be made from a flock of 50 birds in twelve months, I quote the following figures of an experiment. The average quantity of food consumed per bird during this period was:—Bran, 7 lb. 6 oz.; pollard, 14 lb. 12 oz.; dried butter-milk, 4 lb. 5 oz.; wheat, 26 lb. 10 oz.; Algerian oats, 13 lb. 4 oz.; maize, 13 lb. 4 oz.; barley, 6 lb. 10 oz. The total quantity of food fed was 86 lb. 4 oz., and its cost 9s. 3½d. The number of eggs laid was 15 dozen, and they realized £1 3s. 0¼d.; thus the profit over cost of food was 13s. 9d. And it must be remembered that this was the average return from one of 50 birds.

It is difficult to get reliable figures from farms, but it is known that this amount of profit over food cost is being obtained on many irrigation farms in the north.

With good shedding, plenty of litter on the floor, automatic water supply and dry mash feeding, 200 birds should not take up more than an hour per day, and with this number of birds many farmers are making from £90 to £120 per annum over food cost.

I made this statement some time ago, and a writer in a poultry paper adversely criticized the Department's policy in advocating poultry as an adjunct to dairy-farming, and also expressed the opinion that there was not a farm in Victoria on which a profit of 10s. per bird over feed cost was being made. From my observations in various parts of Victoria, I know there are many farmers who are making more than 10s. per head over feed costs. I also know many who are making a lot less, but I never intended to imply that any dairy-farmer without some experience of poultry, and as a return for one hour's work per day, could make £100 per annum from 200 hens; but I do maintain that, with proper equipment and the necessary experience, any intelligent man or woman who has a liking for poultry can do it.

The only successful dairy-farmers that I have met are those who are fond of their cows, take a pride in them, study their feeding and comfort in every way. And unless they are prepared to do the same with their hens, I would strongly advise them to leave poultry out of their farming operations.

In some cases farmers are not getting as high a price for their eggs as they might, because of bad marketing, lack of regularity in gathering the eggs, want of care of the eggs after gathering, marketing eggs ungraded as to size, marketing dirty-shelled eggs, and bad packing. All these things mean depreciated prices.

The increase of poultry production in the Rochester district is remarkable. Eight years ago there were only 500 birds on the settlement; to-day there are over 45,000, and this increase is due principally to the satisfactory returns as a result of good housing and of feeding milk and green stuff.

Housing.

For fowls to be profitable as egg-producers, houses need not be expensive; but must have dry floors, and must be rain-proof and wind-proof, yet well-ventilated. Unfortunately, the majority of farmers think any kind of a house will do, and very often consider a tree good enough for a roosting-place.

Fowls will certainly keep in better health roosting in trees than when housed, but if they are exposed to cold winds, &c., too much of the food eaten has to be devoted to the upkeep of their bodily warmth, leaving a lesser amount for the manufacture of eggs; therefore poor housing is not economic from a food-consumption point of view.

The most suitable depth for houses for laying fowls is 14 to 16 feet, and a shed 30 feet by 15 feet will be suitable for 100 birds, and one 60 feet by 15 feet will house 200 birds. The cost is approximately £1 per foot of length, including labour. On a farm where bush timber is available, or where second-hand timber can be bought, this cost will be reduced.

Feeding.

The dairy-farmer is probably in a position to feed fowls more economically than many poultry-farmers. The basis of nearly all mashes is bran and pollard. Dairy-farmers who feed bran to their cows, and pollard to calves and pigs, are usually in a position to buy in fairly large quantities, and, therefore, at a cheaper rate than can the average poultry-farmer.

I have an open mind as to the best method of feeding fowls for egg-production, as I know poultry-farmers to be successful with dry-mash feeding, others with wet mash; but for a dairy-farmer, the dry-mash method would save a considerable amount of labour, as hoppers can be built to hold enough mash for a fortnight: this means that the fowls need no attention in the morning, a little green feed can be fed at midday, and a full feed of grain at night, followed by as much green feed as they will eat.

The Value of Milk.

There is no better aid to egg-production than milk, either separated milk, butter-milk, or dried milk. In fact, some of our largest egg-producers consider milk so valuable that they keep sufficient cows to supply the amount necessary for their birds. In several feed experiments carried out at the Werribee Research Farm, it has been demonstrated that dried butter-milk, even at the high price of 5d. per lb., is a very valuable addition to the mash.

The Value of Greenstuff.

The dairy-farmer has another advantage in the fact that he always has, or should have, ample green feed for his cows, in the shape of green oats, green barley, clover, millet, green maize, or lucerne, all of which are excellent for fowls. I am of the firm opinion that no man can get the best returns from his birds unless they have constant supplies of green food, as I maintain it is not only necessary from a health point of view, but it is the greatest aid to rapid digestion of other foods that I know. The whole success of the poultry-farmer depends on how much food he can get his birds to eat, digest, and turn into eggs.

The value of succulent greenstuff for laying hens has been demonstrated at the State Research Farm, Werribee. In a feed experiment last year three pens of 50 birds each were fed, housed, and treated exactly the same in every particular except that No. 1 pen (in addition to the ordinary ration of meals and grains) was fed such succulent green food as was in season; No. 2 pen was fed lucerne chaff that had been soaked in water, and No. 3 pen was not given any green food at all. The result was:—

No. 1 pen (fed succulent green feed) produced 7,883 eggs, valued £52 16s. 8d.
No. 2 pen (fed lucerne chaff) produced 7,425 eggs, valued £47 4s. 5d.
No. 3 pen (no green feed) produced 6,610 eggs, valued £41 4s. 4d.

Thus the pen fed greenstuff showed a return of £5 12s. 2d. more than that from the pen given lucerne chaff, and £11 12s. 4d. more than the return from the pen to which no green feed was allowed. For the three months May, June, and July, when eggs were at the highest price for the year, the pen fed greenstuff laid 697 eggs more than the pen fed lucerne chaff, and returned £6 11s. 9d. more in money. During the spring the pen fed lucerne chaff gained a little, but eggs were then at a low price.

The Value of Poultry Manure.

One aspect of the value of poultry on the farm that is often not taken into consideration is the value of the manure. Poultry manure from most of the large egg-producing plants is being eagerly sought after by orchardists and market-gardeners, and some of it is transported over fairly long distances.

It is estimated that a fowl produces approximately 90 lb. of manure in twelve months, so it would be safe to estimate that from every 100 birds 4 tons of valuable manure is obtained. The value per ton given in 1926 is £2 5s., but some dairy-farmers I know would not sell it for double that amount, because they find it gives such splendid results when used for crops and for the top-dressing of pastures.

For some time a poultry-farmer in the Bendigo district sold all the manure from his sheds, and found it was being used for tomato-growing. Last year he resolved to give tomato-growing a trial. The area of land available was only an acre, and no manure was used other than the droppings from his poultry houses, yet the profit from the acre plot, after deducting cost of plants, labour, &c., was £120.

The policy of the Department of Agriculture is to encourage poultry-keeping as an adjunct to other agricultural operations, and it is my opinion that in few places can it be made more profitable than on a dairy farm.

With the advantages already quoted in the way of milk, ample supplies of greenstuff, large numbers of eggs can be produced at the time of the year, i.e., April, May and June, when they are at their highest market value, and this is the time when many dairy-farmers find it difficult to make ends meet, for then they have to depend solely on returns from their cows.

Suggestions for Poultry-keepers.

If good quality eggs are to be produced, the following suggestions should be followed:—

1. Isolate or sell all male birds after 1st October.
2. Gather eggs twice a day if possible, but always once a day.
3. Keep eggs in a cool place not more than 60° F.
4. Protect them from sun, heat, moisture, and bad odours.
5. Treat them as you would choicest cream or butter.
6. Market only clean-shelled, large eggs. Small and dirty-shelled eggs should be consumed on the farm.
7. Market eggs twice a week if possible, but always once.
8. Keep eggs clean by providing clean houses, plenty of clean litter on the floor, and roomy nests; and by changing nesting material frequently.
9. Chickens intended for egg-production should be hatched in July, August, and September only.
10. Breed only from second and third season hens, and from pedigreed male birds.

IRRIGATED PASTURES.

By L. C. Bartels, B.Agr.Sc., Senior Irrigation Officer.

There has been a steady increase in the area of mixed pastures sown in the irrigation districts of Victoria, a development that seems to follow on the extension of top-dressing coupled with a better appreciation of the influence of careful watering.

Pastures were sown at the Werribee Research Farm in small areas soon after the farm was established some fifteen years ago. As time went on, and the stock-carrying capacity of the pastures under irrigation was so well demonstrated, the area seeded to grasses and clovers was extended, and, when the earliest-sown lucerne was ploughed up, some of it was replaced by mixed pasture.

Based on the experience at Werribee, the Department has advocated the extension of pastures under irrigation as a supplement to lucerne, and now in every district it has been amply demonstrated that care and management will ensure good results.

These pastures are long-lived; they provide variety in the feed of stock, and they are productive. Tests at Werribee, where clippings from a definite area of mixed pasture were weighed regularly every month, showed that nearly 20 tons of greenstuff per acre was obtained in one year. Further, they give continuity of feed, since a judicious mixture of grasses and clovers provides for some growth throughout the year, although that growth is restricted in winter.

When one speaks of management of pastures, one may include in that term cultivation and grading of the land for irrigation and preparation for sowing, as well as the subsequent treatment of the pasture in regard to grazing, top-dressing, and watering.

Sowing.

Too much emphasis cannot be laid on the need for careful preparation of the land. The seed should be sown in clean ground and on a firm seed-bed, which has been in bare fallow for at least a few months. For northern districts, autumn sowing is preferable, but in the south, spring sowing will give satisfactory results. It is advisable to sow with manure. An easy method is to mix the seed with super and sow through the manure-run of the drill with the tubes hanging free. In this way the seed will be spread, and a chain looped behind the drill and trailing on the ground will cover it sufficiently.

If favorable rain falls, the seed will soon germinate. Young clovers are delicate in their early stages and weeds (particularly such weeds as Cape weed) are liable to smother them. Too strong a growth of rye grass is inimical to clovers, even when they are mature. Italian rye grass, for instance, will, if unchecked, grow over 3 feet high, and should be kept down.

Grading the Land.

The grading of the land for irrigation is very important. In our dry districts regular watering is essential to keep grasses and clovers in a flourishing condition; even just to keep them alive some watering is necessary. In depressions, grasses and clovers will always grow more abundantly, indicating the influence of moisture. A proper distribution

of water can be effected only by careful grading, and check-banking will facilitate the watering. The border system of irrigation is the one in general use.

Pastures go off very quickly if the ground dries out, and I regret to say that several fields I have seen this season showed evidence of neglect.

Unlike lucerne, pastures will endure a superabundance of water. This does not mean that they should be watered to excess, but its significance is that grasses and clovers may be grown in low-lying country where water will lie for a time after prolonged rain—land that would be

Red Clover.

unsuitable for lucerne. Another point is that in autumn, when the need for winter feed has to be thought of, grasses and clovers may be watered without much risk of harm if heavy rain should follow.

The Grazing of Pastures.

The best results from pastures may be obtained by grazing heavily, with occasional rests for the fields. The short grasses are sweeter and more nutritious, and, indeed, if a pasture is allowed to grow freely, stock will neglect the rank growth and concentrate on patches which they keep eaten short. Subdivision of an area of pasture will help to achieve the desired end.

Top-dressing.

Top-dressing is all-important to maintain grass lands in good condition, and on irrigated pastures an application of 2 cwt. of super. annually is recommended. Autumn is the best time to apply the manure, which may be drilled in, or put on with a spreader, or even applied broadcast by hand.

Scarifying the ground is not a necessary preliminary to top-dressing. It is, however, a wise practice to break and spread dry cow droppings.

A Good Seed Mixture.

The following mixture of grasses and clovers will be found satisfactory:—

	lb. per acre.
Perennial rye grass	10
Italian rye grass	3
Cocksfoot	3
Cow grass	2
White clover	1
Alsike	1
Subterranean clover	1

Hereunder are given the main characteristics of the pasture plants mentioned above, and of a few others:—

Red Clover.

Red clover is a most valuable pasture plant. It makes strong, rapid growth in the early stages and produces an abundance of good feed. It is a biennial. Despite the fact that there are in Australia no bumble bees, which are considered necessary for the general fertilization of the flowers, red clover seeds fairly well and odd plants develop in scattered parts of a field.

Cow Grass.

Cow grass was introduced to Australia as a perennial form of red clover. Most irrigation farmers are familiar with this plant, which may grow to a foot or eighteen inches in height. It has big leaves, hairy, with a definite white marking. The flower-heads are conspicuously bright. As is the case with red clover, cow grass after a few years gradually disappears from a pasture.

Alsike Clover.

Alsike clover, a very useful pasture plant, was first grown in Sweden. It partakes of some of the characteristics of both red and white clovers, and it was originally assumed to be a cross between the two. It has the reputation of being particularly suitable for wet conditions. It lasts for five or six years, and is generally very conspicuous in a pasture during its second year. A splendid growth of Alsike clover was to be seen this season on the farm of Mr. J. Nihill, at Tongala; and a neighbour, Mr. Bullingham, had a nice area of pasture in which Alsike was prominent.

White Clover.

White clover is an excellent pasture plant, and is developing naturally in all the irrigation settlements. The best white clover field I have seen is on the farm of Mr. J. Platfuss, at Wyuna, where top-dressing and careful watering make for most luxuriant growth. White clover is perennial. It seeds freely, but it propagates mainly by its creeping

stems, which roots at the joints, and it soon spreads through a pasture. This gives it an aggressive character, and enables it to grow freely, even amongst paspalum; it is a splendid complement to that grass. Mr. T. Major, at Colluna, has a field with such a combination. In certain places this clover spreads naturally. In the Maffra district, for instance, it grows freely, and some farmers there do not include the seed when laying down pastures. All the same, I do not recommend any one to omit it from a seed mixture because of the chances of a sufficient amount of seed being carried to the paddock.

Alsike Clover.

White Dutch.

There are several other strains of clovers which have come under notice in different districts, White Dutch, English wild white, and Lladino clover are the most common.

White Dutch is the common strain of white clover usually imported from Europe.

English Wild White.

English wild white is a natural selection which has developed and spread in old English pastures. It shows an adaptation to environment, and withstands rigorous winter conditions. It is a clover with finer foliage than the ordinary White Dutch, so-called. It forms a

very close mat of creeping stems, and under favorable conditions it will make rapid and abundant growth in spring. As might be expected, it does not withstand dryness so well as our acclimatized strains, and some degree of resistance is a desirable quality in any grass forming part of a pasture on a Victorian farm.

Lladino Clover.

Lladino clover is a rather coarse strain of white clover which was introduced from Italy. While conditions are favorable it makes abundant growth, but it will not flourish unless well looked after.

Wild White Clover.

Subterranean Clover.

Subterranean clover has grown in favour in irrigation districts, and most settlers are familiar with it. It is an annual, and dies down about November of each year, but because of its peculiar method of burying its seed, it continues from year to year and thickens up.

When this clover establishes itself, the buried seeds germinate in autumn, or even in summer for that matter. The young plants make rapid growth under irrigation in autumn, and it is this feature which commends it. In September the long trailing stems may extend in all directions; a mat of foliage develops during October, and there seems to be a danger of its monopolizing the ground, but there is no real danger if other grasses and white clover are growing with it. It is palatable to stock, and can be kept down by heavy grazing. If allowed to grow abundantly and die off, the dry feed will be readily eaten by stock.

Subterranean clover thrives in all our irrigated dairying country. It grows well at Cohuna, and asserts itself even amongst paspalum.

Strawberry Clover.

Strawberry clover—so called from the colour of its flowers, the shape of the seed-heads and from its creeping stems—is regarded with mixed

Strawberry Clover.

feelings by irrigation farmers. Those who know it well are agreed that stock are fond of it; but many complain that it does not grow freely. True enough, it has a creeping habit of growth, and is not prominent except that it spreads and monopolizes patches of ground, particularly in the depressions. Stock are exceedingly fond of it, and horses will paw the ground to get it, and consequently on any land that is continually being grazed it gets no chance to develop.

Strawberry clover luxuriates in moist situations, but coupled with this liking for moist places it has abilty to resist dryness. It has developed naturally in many districts, and in mid-summer it can be seen in patches with its dark green foliage, pointed leaflets and rosy-coloured flowers, growing in depressions on road-sides and in paddocks where water sometimes lies.

The seed of strawberry clover is expensive, and sometimes it is difficult to get a good germination. It is is advisable, therefore, to rub the seed over sandpaper, or some such rough surface, so as to wear the seed-coat a little. This may seem to be a tedious process, but it must be remembered that 1 lb. of seed will go a long way.

A sure way of introducing strawberry clover is to dig spits of earth containing portions of the creeping stems and transfer them where required, or simply to "heel in" the stems during early spring in low-lying pastures.

The strawberry clover flats at Tarwin are the finest in the State. At Swan Hill there may be seen growing on the river flats a very vigorous strain of strawberry clover.

Should Lucerne be Included in Pastures.

Some people ask—What about lucerne? Is it suitable for inclusion in pasture mixtures? It is, and 1 lb. of seed per acre will provide a fairly dense growth of lucerne, which will contribute to the bulk of the pasture during the summer months. In the early years of a pasture it will be conspicuous, but under grazing it will gradually disappear. Stock nibble the young shoots and the crowns, and, notwithstanding the hardness of the plants, they die out. Lucerne is an important element in pasture mixtures for places where water supplies may be limited. Its deep-rooting habit makes it resistant to dryness, and it will look fresh and vigorous when white clover, for example, is wilting. In passing, I might add, that besides lucerne, Subterranean Clover, Wimmera Rye, Sheep's Burnett, Toowoomba Canary Grass, and Tall Oat Grass show a resistance to dryness.

The grasses as distinct from the clovers which are recommended for pastures are Perennial Rye Grass, Italian Rye Grass, and Cocksfoot.

Perennial Rye Grass.

Perennial Rye Grass, which is made the basis of the mixture recommended on page 113, is also known as English rye grass, Irish Ben, New Zealand rye, Poverty Bay rye grass, Western District rye grass, &c. These are names adopted for regional strains of Perennial Rye.

I might say at this point that acclimatized strains of seed, if they are productive, are the best suited for any country. Naturally, rye grass from Europe, which has adapted itself to the moist conditions there, is not altogether suited to Australian conditions, particularly to those obtaining in our irrigation settlements.

Rye grass dislikes drought conditions, and in dry areas will die out of the pastures if they are not irrigated regularly. At the same time, it must be conceded that strains of rye grass develop in particular environments. In every aggregation of plants there are some which adapt themselves to dry conditions, and carry on from year to year, resisting dryness and waiting for rain.

At Cohuna some 30 years ago Mr. Woodman sowed a small area of rye grass on the farm now occupied by Mr. T. Major. It has spread naturally through an old lucerne paddock. White clover and paspalum have come too, and, while no lucerne remains, this natural pasture is most abundant.

Italian rye grass is included in the mixture suggested (page 113) because it makes rapid growth and provides a lot of feed while the other plants are developing. It is an annual or biennial grass, and carries on by re-seeding. Although some plants will show up after many years, it cannot be regarded as a permanent element in a pasture. Only a small seeding is suggested because in its early stages this grass will grow tall and dense, to the detriment of the clovers and other grasses which are tiny when young.

Westernwolths Rye Grass is a strain of Italian Rye Grass.

The objection has been raised that there is a tendency for the rye grasses to disappear. They do thin out if a strong growth of clovers is fostered by top-dressing with superphosphate. The durability of Victorian-grown seed seems greater than that from elsewhere, and heavy grazing favours the rye grass.

Prairie Grass.

Prairie grass may be sown in addition to Italian rye grass, or it may be sown as a substitute. It is not perennial, but it seeds freely, and will show up in pastures if they are not grazed too heavily. It is a rapid grower, a good winter grass, and stock are very fond of it.

Cocksfoot.

Cocksfoot is a long-lived grass with a good reputation, and suited to a variety of conditions. It thrives in Gippsland, and I have seen plants sixteen years old in the Goulburn Valley. Unless it is heavily grazed, it grows into tussocks, but in a closely grazed pasture it does not seem objectionable in that way. It remains prominent in a pasture, and it would seem that stock prefer other grasses if they are plentiful.

Other Grasses.

Other grasses are under observation in departmental tests, e.g., Timothy, Meadow Foxtail, Fescues, Kentucky Blue Grass, Toowoomba Canary Grass, &c.

Timothy does not seem to do very well under our conditions, although it remains, to some extent at least, in old pastures.

Meadow Foxtail seems to be more persistent. It is an early grower with soft foliage, and makes good feed: it flourishes where there is plenty of moisture.

Kentucky Blue grass forms a most important part of the seeded pastures of America. It is long-lived and somewhat aggressive, and its seed-stalks get very wiry. It is an early and a rapid grower and fairly resistant to dryness.

The Fescues vary considerably in quality from the small setaceous types to the coarse, reedy ones.

Meadow Fescue deserves consideration. The tall variety of Meadow Fescue is rather coarse and assumes a tussocky habit, but the foliage is apparently very palatable, for I have noticed that the tussocks are usually eaten down.

Toowoomba Canary grass grows very well in winter, and seems to be resistant to dryness.

THE MILK-RECORDING MOVEMENT IN EUROPEAN COUNTRIES.

The years preceding the outbreak of the Great War showed a remarkable development in milk-recording, especially in north European countries, as the following figures show:—

	First Society Formed.	Approximate number of Societies in 1914.
Denmark	1895	.. 633
Sweden	1898	.. 799
Germany	1897	.. 792
Norway	1898	.. 140
Finland	1899	.. 200

During the same period, the movement also developed considerably in the old Russian Empire, in Austria Hungary, and in Holland.

Turning to the post-war period, we find that Denmark had no fewer than 1,228 milk-recording societies in the year 1924-25, and that the total number of cows on record was 430,000, or close on 31 per cent. of the entire national herd.

Sweden had only 424 societies at work in 1919, and the number of controlled cows had fallen to 115,000 as compared with 220,000 five years earlier. Since then, however, there has been an upward tendency, and the number of societies at the close of 1925 was 606, with 200,000 cows, or about 11 per cent. of the total national herd.

In Norway, too, there has been considerable growth of recent years. During the war, the number of societies had fallen very low, and in 1919 only 73 were at work. In 1923-24, the number had risen to 248, with over 50,000 cows, and for 1925-26 the number of societies is estimated to be 330, with 67,000 cows, or about 9 per cent. of all cows in Norway.

In Finland, development has been rather more slow, but the number of milk-recording societies in 1924 was 379, with 115,000 cows, or 9 per cent. of the total national herd. The average milk yield per cow was rather better than 477 gallons, with 3.92 per cent. fat. Women are extensively employed as recorders.

Of the societies which existed in Germany in 1914, over one-half were dissolved during the war. The movement showed a rapid recovery after the conclusion of hostilities, and in 1922 no fewer than 1,058 societies were at work. This figure had increased to 1,610 in 1925, with altogether 581,000 cows. The movement is most general in East Prussia, where 24 per cent. of all cows are on record, but it has made but little progress in Southern Germany, so that, for the Empire as a whole, barely 7 per cent. of all cows are included in the movement.

In Holland, where the first society was started in 1900, considerable progress has been made. The number of breeding and milk-recording societies in 1924 was 553, with 183,000 cows.

Poland founded her first society in 1904, but all societies were dissolved during the war. In 1926, 79 societies were reported to be at work in the vicinity of Warsaw.

France has only recently begun to take an interest in milk-recording, but the movement to found societies is progressing rapidly there during the past couple of years.

BACON CURING.

These notes are intended as a guide to the settler who desires to make bacon on his farm, and the first essential thing to observe is that all pigs for killing are in perfect health, otherwise they will never make good bacon.

The best class of bacon is only obtained from young pigs ranging from six to eight months old and weighing from 140 to 180 lb. live weight, which is equal to 105 to 135 lb., dead weight.

Before killing, pigs should be without food and remain quiet for 24 hours, while they should have access to plenty of clean water.

The pig should first be stunned, and then "stuck" by inserting a long knife in the pig's throat, immediately in front of the breast bone, with the point towards the tail. This severs the arteries on both sides.

The pig should be well bled. The scalding vat should be three parts filled with hot water, the temperature of which should be from 165 to 175 degrees Fah.

The carcass should be immersed and kept moving. After soaking the pig should be lifted and scraped. When scraping, start with the head and feet. See that the nose, ears, and feet are made sweet and clean. Hot water may be used while scraping is taking place. When all clean, the pig is hung up, cut open and intestines removed. When the pig is cool it should be laid on a table and cut up; the head being first removed. A deep cut is made with the knife along the back, close to the bone, from tail to poll. Saw the ribs from each side of the backbone. Lay the sides flat, and remove leaf lard, kidney, &c.

If it is not desired to cure the whole side in one piece, the shoulder and ham should be cut off.

Curing.—The temperature of the curing room should, if possible, be kept down to 60 deg. Fah.

For dry curing the following recipe is recommended:—Fine dry salt, 50 lb.; brown sugar, 5 lb.; saltpetre, 2 lb.

For the first three or four days this mixture should be rubbed in over the flesh parts and around the bones and joints. The sides should be stacked and the position changed each day. The time required for curing will be about fourteen days. Continuous hard rubbing results in a hard cured flesh.

Pickling.—For pickling the following is a good recipe: Clean rain water, 20 gallons; fine dry salt, 50 lb.; brown sugar, 5 lb.; saltpetre, 2 lb.; allspice, ½ lb.

Dissolve the salt, sugar, and saltpetre in the water, then put in allspice, tied up in a calico bag; boil for one hour and skim. If frothy matter rises on the surface whilst boiling, it should be skimmed off. Allow the solution to cool before use. The above quantities are sufficient for 500 lb. of meat.

The sides should be rubbed with salt for two days before being immersed in the pickle. After dry salting or pickling the flesh is brushed to remove pieces of salt, fat, &c., and then washed in rain water, and soaked in a solution of bi-carbonate of soda for 24 hours. (The solution is made by dissolving 1 lb. of bi-carbonate of soda in 20 gallons of clean rain water.) After this, wash in clean rain water.

Hang up in an exposed, dry place, until the bacon is thoroughly dry, then remove to smoke-house, and smoke to suit taste, after which, finish the sides by dressing and rubbing the skin with pure olive oil.

THE RABBIT IN AUSTRALIA.

Its Introduction and Spread.

The records of early Melbourne show that the harmony of the little settlement on the Yarra, destined to become the metropolis of Victoria, was, in the year 1836, disturbed by a dispute which arose between Henry Batman—brother of John Batman—and John Pascoe Fawkner, in connexion with the destruction of rabbits, and other matters. At that time there existed no officially constituted tribunal to deal with disputes between the inhabitants, and therefore arbitrators approved by the disputants themselves were selected to hear the evidence and deliver judgment. The arbitrators were Dr. Thomson (the first medico), John Aitken (the first stock-breeder), and James Simpson (the first magistrate), who, after examining the evidence, furnished on 2nd May, 1836, delivered the following award, which was the first legal decision given in the colony:—"We award in the dispute between Mr. Henry Batman and John Pascoe Fawkner, on the first claim, thirty shillings; on the second claim, nothing, although a strong presumption is on our minds that some hasty expressions of Mr. Batman may have led Bullet to destroy the rabbits. On the third claim, damages five shillings, and a fine of twenty shillings in consideration of its being an act of unauthorized aggression; and, on the fourth claim, nothing, as it does not appear that Mr. Batman set the dogs on the calf, &c., &c."

From the evidence adduced, although the above indicates the contrary, it would appear that Fawkner was the complainant and Batman was the defendant. "Bullet," who actually destroyed the rabbits, was, it is believed, an aborigine from New South Wales, brought over by John Batman, via Van Dieman's Land, to assist him in his land transactions with the Port Philip aborigines. There is nothing in the award to indicate whether the rabbits were wild grey rabbits or of the white specie, but there is reason to believe that they were the latter variety.

It is well known that some of the early English colonists, finding that the continent possessed very little indigenous game, and feeling that a few rabbits released upon their estates would provide an additional charm and interest to the landscape, as well as an exciting target for the gun, attempted to introduce them in the fifties and sixties, and, it has been stated, by earlier colonists also in the forties. But it would appear that their efforts were for a long time unsuccessful, and that during the long voyages out in the old sailing ships the rabbits either succumbed to the intense heat while passing through the tropics, or when they arrived here they perished through climatic changes, or the attacks of the native cats, which were then numerous.

In subsequent years it was proved that one land-holder who imported a dozen rabbits found that their depredations cost him something like £1,000 per head, and many others had also great cause to lament their folly. They overlooked the fact that in a thickly-populated country rabbits cannot increase to the same extent as they do in a country where the population is sparse, and that the same rabbits which, on account of the large population, were doing no appreciable harm in England or

the adjoining continental countries, must become a serious plague in a sparsely-populated country such as Australia, possessing so much natural cover to protect them.

At first they increased and spread very slowly, for the eagle and the hawk accounted for a few young ones, and the native cats also accounted for a great many of the young rabbits, to which they were particularly partial. At length the rabbits secured a firm footing—increased and spread more rapidly. There is no doubt that, as the rabbits increased in number, the cats diminished, until in the early eighties they were rarely to be seen. It has been said that in some localities they were almost exterminated by a disease which attacked them, but as no specie of animal has ever been known to become, through disease alone, practically extinct within such an extensive tract of country, it is likely that some other cause was responsible for their almost entire disappearance.

Gradually extending from their several starting points, the rabbits soon overran the whole of the fertile western district, the climatic, soil, and surface conditions of which were ideally suitable for their increase. The stony rises and extensive patches of bracken fern constituted a veritable stronghold from which it would have been impossible to eject them, even were the country closely settled and the inhabitants organized into a fighting force; but, with the country sparsely populated, no legislation in existence providing for suppressive measures, and their natural enemies an inconsiderable factor, there was no chance whatever of arresting their progress, let alone exterminating them. The rabbits easily burrowed into the soft, friable, volcanic soil, and the loamy rises in particular became in many parts the chosen sites for large warrens and detached burrows, round about which there was nearly always plenty of sweet green grass. These warrens, with their network of subterraneous passages, sheltered hundreds of rabbits. In course of time, the more venturesome units of the settlement travelled out into the adjoining country, and founded fresh settlements. Thus they spread from cover to cover right throughout the central and south-western sections of the State. The indifference with which the rabbits were hitherto regarded was displaced with a feeling of concern, as the authorities saw this rich and fertile section of the State overrun, and the land-owners threatened with serious loss. So in 1880 the first Vermin Suppression Act was passed. It provided for simultaneous and other attacks, and the imposition of a penalty upon land-holders who neglected to comply with the Act.

Hoping to arrest their progress, and to thus protect the north-western country, vermin-proof fences were constructed ahead of them, one fence extending from Swan Hill to Lake Albacutya, and thence to the South Australian border. Boundary riders were employed to supervise and repair the fence where necessary. In addition to this precaution, the *Rabbit Suppression Act* 1880 provided for the imposition of a maximum penalty of £20 upon any person who should wilfully set loose any rabbits in any part of Victoria, but, in spite of netting fences and the provision of this penalty, rabbits broke through and were conveyed into the country beyond, and the north-western section of the State soon became badly infested.

The South Australian and Victorian Governments in 1887 erected conjointly a rabbit and wild dog-proof fence between the two States. The former Government erected the northern half, from Serviceton north-

ward to the Murray River, and the Victorian Government the southern half, from Serviceton southward to the sea. The length of this fence was about 290 miles, and the cost of its erection and maintenance by boundary riders was very considerable. Gates, of course, had to be provided at certain distances, and some one placed in charge to see that they were kept closed.

The land-holders in each State felt that it would be useless to attempt to destroy the rabbits on their runs whilst reinforcements could constantly pour in from the adjoining border country. With the fence erected, it was felt that the Victorian station owners would have to destroy their own vermin only, and the South Australian station owners were prompted by the same feeling. It was also thought that with the fence erected 3,000,000 acres of unoccupied mallee country on the Victorian side would be readily taken up, and the rabbits thereon easily destroyed. The erection of the border fence was only part of a scheme for isolating and intersecting the mallee block country. By using the border fence as a base, and erecting numerous other connecting fences, it was believed that the mallee country would eventually be enclosed by a network of fences, which would be an effective check to the vermin, and would enable the lessees to successfully grapple with the pest enclosed within the fences. This was all very easy to project, but most difficult to accomplish. The border fence was completed, and one at least of the projected cross-country fences, but the fences did not accomplish all they were expected to do, or anything approaching it. Land-owners could not be induced to display the same interest in the Government fence as they did in their own fences, in which they felt a personal interest and responsibility. This has been the experience in every colony. Fences erected at the expense of the Government were common property, and although collectively the land-holders were expected to give them the necessary attention, they did not do so.

Penalties were provided for leaving the gates open, and yet they were left open time after time. In fact, it is on record that some of the supervisors had to employ great cunning and strategy to apprehend certain individuals, who deliberately, in defiance of the law, did their best to maliciously defeat the vigilance of the Government officers. But, apart from the carelessness or perversity of the land-holders and others, the fence was not for long an effective barrier. Leaves from the vegetation in the vicinity were heaped up against it by the winds, and the drifting sands from the wind-swept sandy country adjoining piled up and up against the fence until in parts it became completely covered. Small sand heaps became sand hills, and in several places fresh fences had to be erected on top of the old ones. The netting soon corroded in the salt-laden sand, and became useless. When it was realized how difficult it was to maintain in an effective condition lengthy lines of Government netting, especially in this country, the whole scheme collapsed. Altogether about £26,000 were spent in erecting the border fence, irrespective of the cost entailed in supervising and maintaining it.

BEES AND POLLINATION OF FRUIT TREES.

The immense value of the bee industry is a minor consideration to California when compared with the immense benefits received by the fruit and vegetable industry from the mere presence of bees as their chief pollinizing agents. Innumerable experiments have proved conclusively that wind and native insects are minor factors as pollination agents, hence the burden of pollinizing California's million and a half acres of fruit and vegetables is upon the bee industry. Experimental studies of pollination are far from completed, except with a very few crops. In general, they tend to show, where counts have been made, that the honey bee as a pollination agent exceeds all native agencies by 100 to 1 as visitors to the blossoms at time of pollen maturity.

Experiments have shown that the presence of the honey bee increases, over all pollination agents, the set of fruit of the almond, apple, cherry, pear, plum, and prune from 300 per cent. to 3,000 per cent.

To further stress this point, some of the cardinal advantages of the honey bee over other insects as a pollinizing agent can be pointed out:—

1. Workers do not die during the winter, as do native insects.

2. The honey bees winter in active condition—neither dormant, nor resting in the egg or pupa—ready for work early in the spring.

3. The honey bee is the only insect pollinizer which can be distributed as desired in the orchard.

4. It is possible to increase the brood of bees, or build up a colony so that a large number will be available in the spring.

5. They are structurally better fitted for their job of pollinizing than any native insect.

—From the *Monthly Bulletin of the Department of Agriculture*, State of California, United States of America.

ORCHARD AND GARDEN NOTES.

The Orchard.

Young Trees.

Young trees of the Citrus family should now be making a good, thrifty growth. The foliage should be glossy, and its general appearance a bright green and healthy one. Occasional light waterings, as well as mulching of grass, or of well-rotted manure, will be helpful to the trees

Young deciduous fruit trees will also benefit by having a grass or manure mulch; and, if it has not previously been attended to, unnecessary growths in the centre of the tree and on the main leaders should be removed.

Fumigation.

Evergreen trees, including those of the citrus family, that are infested with scale, should now be sprayed or fumigated to rid the trees of this pest. For spraying, a weak red oil emulsion, lime and sulphur spray, or resin wash will be found useful. The most successful method, however, of dealing with the scale pest is by fumigation. The trees should be closely enveloped in an airtight sheet or tent, and hydrocyanic gas generated inside. The chemicals for generating the gas, as well as the fumes of the gas itself, are excessively dangerous, and great care is necessary in their manipulation. A wooden, enamel, or earthenware vessel is placed inside the tent, the vessel containing a mixture of 4 fluid ounces of sulphuric acid, and 12 fluid ounces of water, the acid being placed in the vessel first. Four ounces of cyanide of potassium is then quickly dropped into the vessel, the tent closed down at once, and the bottom of the tent all round covered with soil to prevent any of the gas escaping. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at nighttime or on a cloudy day, if the foliage of the trees be thoroughly dry.

The Vegetable Garden.

Celery crops will now be a prominent feature in the vegetable section. The seed may be sown from January to March, and succession plantings should be carried out occasionally during those months. The growth of celery should be quick; a fair supply of water and a good rich, loose soil are helpful to its growth.

Ample water will now be required in the vegetable garden. The surface should be kept well hoed, and mulchings of manure given wherever possible.

Cabbage, carrot, turnip, radish, lettuce, peas, cauliflower, &c., seeds may now all be sown, and young plants from any seed beds planted out.

The Flower Garden.

Constant watering and hoeing will now be required for successful gardening. Cannas will require manuring; the old flowering stem should be removed to make way for the new growths. Dahlias and chrysanthemums will need a great deal of attention, staking the growths

as they develop, disbudding, thinning out weak shoots, and removing unnecessary growths. The dahlias should receive a good soaking of water during the hot weather, and liquid manure or quick acting fertilizers given when the flower buds are developing. When chrysanthemum buds are very small, liquid manure should be applied. Roses may now be summer pruned; all weak growths should be removed, and the strong ones shortened to a fairly good bud. The plants should then receive occasional waterings with liquid manure, and be kept well supplied with water.

All flowering trees and shrubs that have finished blooming should be pruned, the flowering growths removed, and, unless the seed is required, all seed heads cut off.

Cuttings of pelargoniums, zonale and regal, may now be planted, and delphinium spikes that have finished flowering cut down to make way for new growth, the plant being watered and manured. Seeds of perennial and hardy annual plants, especially winter-flowering sweet peas, Iceland poppies, stocks, and pansies, may now be sown, and a few bulbs for early flowering planted. The beds should be well manured and deeply worked in anticipation of planting the main crop of bulbs.

REMINDERS FOR MARCH.

LIVE STOCK.

Horses.—Feed as advised last month. Those in poor condition should be "fed up" in anticipation of winter.

Should horses not be feeding well and salivating, examine mouth for grass seeds. Horses running at grass are frequently affected by them. The seeds should be removed, and a mild mouth wash used. A very weak solution of Condy's Fluid will answer the purpose.

Grass seeds also cause blindness if not removed from the eye, and the inflammation reduced by bathing the eye with boracic solution. A teaspoonful of boracic acid to a pint of boiling water is the correct strength for the purpose. Should a scum remain over the eye inject into the eye every other day a small quantity of the following solution:—Sulphate of zinc, 4 grains; water, 1 pint.

Cattle.—Cows in milk should have plenty of succulent fodder and water easy of access. When cows in milk have to be fed on chaff it should be soaked with about half its bulk in water from 12 to 24 hours and the necessary concentrates mixed in at time of feeding. This soaking will soften the grain in the chaff, preventing its loss in the droppings, and is the nearest substitute for the succulence so necessary. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows and those required for town milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter and give the best returns for the season, and be dried off when the grass is dry and scarce. Calves should be given lucerne hay or crushed oats where grass is not available. It will pay well to feed crushed oats to good cows. Provide the following lick for cows:—

Salt, 40 lb.
Bone flour, 20 lb.
Sulphur, 15 lb.
Lime, 25 lb.
Potassium iodide, 5 ounces.

PIGS.—Sows about to farrow should be provided with short bedding in well-ventilated sties. See that the pigs have shade, and water to wallow in. Pigs should be highly profitable now. Pollard should be used for very young pigs, and bran for suckling sows, and to help to prevent constipation.

SHEEP.—Towards the end of March, the earliest of the northern lambs are due (late October matings), and all ewes in the northern district should be kept strong for lambing. Crutching is essential, particularly if ewes are likely to become dirty in the autumn. Wool should be cleared from udders and well up over the tail. Young ewes of the merino or fine crosses are very apt to suffer if not crutched, and lambs may be lost in bad weather if this work is not attended to at the proper time. Clear wool from eyes also in the case of fine-wooled sheep. Handle ewes carefully when crutching if near lambing, as losses may result from rough treatment. Pure British breeds of ewes and coarse cross-breds may be still coming into season; in such cases, rams should be left mated to make sure of a good lambing.

In almost any season foot-rot is common. Attention should be given regularly in such cases. Pare the foot (except the extreme tip of the toe) with a sharp pair of pruning shears and strong knife, and remove the diseased parts. Then apply some form of treatment; some of the patent mixtures are very good for the purpose. A mixture made as follows will be found satisfactory:—Take one quart of good Stockholm tar, and warm it until it becomes thin, and then add a cupfull of powdered bluestone, and mix well (sometimes it will take quite a time to mix the tar and the bluestone thoroughly); then add two teaspoons of lysol and stir well, and then a little turpentine (just sufficient to make the mixture as thin as paint). Apply with a flat brush.

Ready attention should be given to all cases of fly, ophthalmia, grass-seed blindness, casting, pizzle trouble, &c.

It may pay to feed oats or other concentrates to breeding ewes in low condition, in preparation for lambing. Stocks of these foods should be secured while the market is favorable for their purchase.

Reserve the best paddock near the homestead for the lambing ewes, if possible. Ample supplies of good water is still a vital necessity until the weather breaks.

POULTRY.—Cull out the drones and get rid of surplus cockerels. Keep forward pullets well fed—eggs are rising in value. Repairs to houses should be done this month. Thoroughly cleanse all houses and pens. Spray ground and houses with a 5 per cent. solution of crude carbolic acid. The regular use of Epsom salts and sulphur once a week for the next three months, combined with strict cleanliness, will act as a safeguard against chicken pox: 1 oz. of salts and ½ oz. of sulphur to every twenty birds should be given in the mash—salts one day, and sulphur three days after. Burn all refuse and old feathers. Provide a liberal supply of green food. For each moulting hen, add a teapsoonful of linseed to the morning mash. Drinking water should be kept in cool shady spot.

CULTIVATION.

FARM.—Work fallow where possible for autumn sowing of cereals. Sow winter fodder crops, such as rye, barley, and vetches. Prepare land for lucerne plots for autumn seeding. Make silage of maize and other crops for winter use.

ORCHARD.—Prepare new land for planting; plough deeply and subsoil; leave surface rough. Plant out strawberries after first rain. Plant crops for green manure. Continue to fight the Codlin Moth.

VEGETABLE GARDEN.—Prepare ground for winter crops. Plant out seedlings in moist soil. Sow cabbage, cauliflower, lettuce, early peas, swede turnip, beet, carrot, radish, and early onions.

FLOWER GARDEN.—Cultivate and water. Feed dahlias, chrysanthemums, and roses. Plant out shrubs, trees, and all kinds of bulbs. Sow hardy annuals. Plant geranium and pelargonium cuttings. Spray for Aphis, Red Spider, and Mildew.

VINEYARD.—Select scions, if not done last month. In cooler districts, where ripening of grapes is difficult, it may be assisted by removing basal leaves only, as soon as berries change colour. This is the month for drying currants, sultanas, and gordos (Lexias and Clusters). Do not pick before grapes are properly ripe. For instructions for packing grapes for export, apply to Department. Shipments should be made in March and early April.

Cellars.—Vintage month. For light dry wines, pick as soon as grapes are ripe; do not wait for over-maturity, as is so often done. Pay attention to temperature control and acidity; correct latter, if deficient, with tartaric acid or late grapes. Acidimeter supplied by Department; price 10s. 6d. Sulphiting and the use of pure yeasts are strongly recommended, as they insure production of sound wine; further information supplied on application.

BEE-KEEPING.

During February bees commence to arrange their stores of honey and pollen in preparation for the coming winter, and it is therefore unwise to interfere with the combs in the brood chamber, to insert empty combs between the brood, or to change the position of the combs.

Where there is a surplus of honey in the upper story, it is best not to take the whole of it in one operation, but to take half, and when the emptied combs are filling up again take what was left. At this time of year bees will work better and keep on breeding longer with a full, or partly filled, super than with empty combs above the cluster of bees.

When there is a shortage of honey in February or March, it is best to give only enough sugar syrup to carry the bees through till April, but to give whatever amount is necessary in the shortest possible time. Feeding extending over many days will stimulate brood-rearing, and a few weeks later the bees will be short of food again, compelling further feeding.

In the case of colonies below the normal strength in the number of bees, continuous light feeding will do no harm; it will, on the contrary, be beneficial, as it increases the number of young bees, but the feeding for winter stores should be deferred till the middle of April, when but little of it will be used for brood rearing.

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A sturdy and rapid grower; it has a strong tap-root, enabling it to stand long periods of drought. Stalks break easily, and are very succulent right through. **Will not taint the milk.** Sow 4 to 6 lbs. per acre in drills; 8 to 12 lbs. broadcast. **Will fatten 3 more sheep per acre than any other kind. 10d. lb.; 80/- cwt.**

Dwarf Essex

Imported English (true), 8d. lb.; 65/4 cwt. Dutch, 7d. lb.; 60/- cwt. New Zealand (from imported English Seed). Finest quality. Grown from pure stock. **7d. lb.; 60/- cwt.**

White Mustard

Prevents Blowing in Sheep. 1 lb. per acre with Rape. **1/6 lb.; 150/- cwt.**

Egyptian or Berseem Clover

"Misskawi" Brand (imported direct), specially re-machine cleaned

A GREAT WINTER FODDER

Recommended as an annual Winter Clover for warm countries where irrigation is practised. Valuable for its green or dried fodder, and as a winter soiling crop for orchards, vineyards, &c., on irrigated land. A strong-growing annual, with succulent, fleshy stems and broad, soft leaves. The flowers are cream or pale yellow in colour, and are clustered together in a compact, cylindrical spike.

The first cut is available from 45 to 60 days after sowing, followed by a second and third cut, and sometimes a fourth, although the latter is never heavy, and is usually reserved for seed. All kinds of stock eat it readily, and it may be given to them at any stage of growth; it does not taint milk in the slightest degree. This Clover will re-seed itself in a pasture on good land, and thus becomes practically permanent.

Fallow must be thoroughly clean prior to seeding. Sow through the drill, but care should be taken to see that the points of the drill are kept just on the surface of the ground.

Graze lightly, or cut when plants are a few inches high. They will then stool out well. **Sow 8 to 12 lbs. per acre in drills, or 20 to 30 lbs. broadcast.**

1/3 lb.; 120/- cwt.

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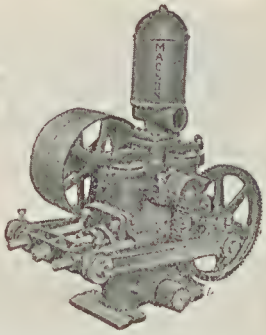

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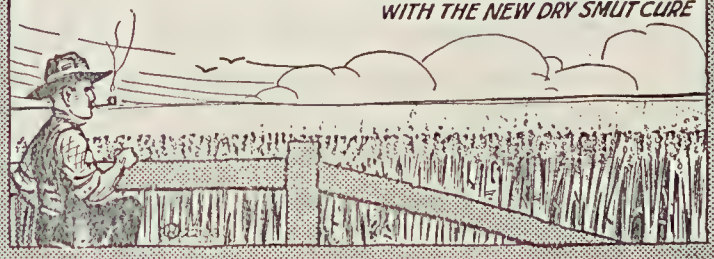

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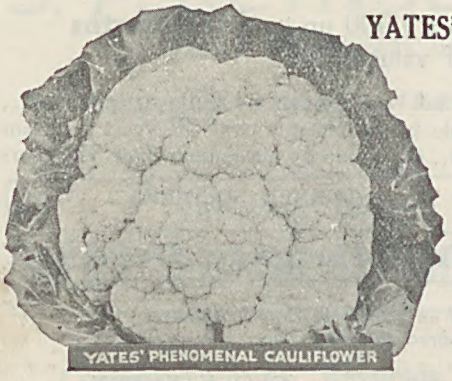

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Red Poll Dairy Herd

The Department has now completed the orders for calves that were booked ahead of calving when the advertisement was withdrawn; consequently the booking of orders for bull calves from the forthcoming calvings has now been resumed.

BULL CALVES are sold for delivery at a month old at prices based approximately on the actual milk and butter fat record of the dam at the rate of 1s. per lb. of butter *fat* yielded. Thus a calf from a cow with a 400 lb. butter fat record is sold for 20 guineas, one from a 300 lb. butter fat cow for 15 guineas, and so on. Bull Calves ex heifers on their first calf are sold for a set price of 10 guineas.

(For Record of Yields of dams see Red Poll Herd Book.)

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VICTORIA VOLCANO (322 A.)

Sire: Nicotine (69 A.A.) by Acton Dewstone (imp.) 9524 (4 A.A.).
Dam: Tonga (253 A.) by Honingham Archbishop (imp.) 9702 (48 A.A.).

Tonga's butter fat yields for 6 successive lactation periods are as follow:—1916, 341 lb.; 1917, 398 lb.; 1918, 419 lb.; 1919, 479 lb.; 1920, 428 lb.; 1921, 562 lb.

BELLIGERENT (Imported) 11096 (8 A.A.)

Dam's Record (1st milking) 7144 lb. milk.

Dam's Dam's	,,	14533 lb. milk	...	4	years	average	12871 lb. milk.	
Sire's Dam's	,,	10370	,,	... 7	,,	,,	9354	,,
Sire's D. Dam's	,,	9510	,,	... 12	,,	,,	8033	,,
G. Sire's D. Dam's	,,	10215	,,	... 7	,,	,,	9386	,,
G.G. Sire's D. Dam's	,,	12565	,,	... 10	,,	,,	8853	,,
G.G.G. Sire's D. Dam's	,,	10088	,,	... 2	,,	,,	9754	,,

BIT O' 'BACCA (Vol. 3)

Sire: Nicotine (69 A.A.) by Acton Dewstone (imp.) 9524 (4 A.A.).
Dam: Nictitana (311 B.) by Nicotine (69 A.A.).

Nictitana's butter fat records for 6 successive lactation periods are as follow:—1918, 450 lb.; 1919, 396 lb.; 1920, 393 lb.; 1921, 465 lb.; 1922, 524 lb.; 1923, 536 lb.

Inspection of the Herd is Invited.

Visitors will be met at the Station on notifying the Manager, State Research Farm, Werribee.

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